

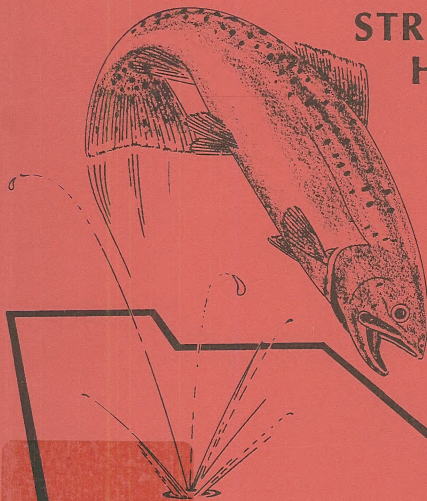
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BIRCH CREEK

INTERAGENCY STREAM HABITAT SURVEY



Utah Cutthroat

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BIRCH CREEK

INTERAGENCY STREAM HABITAT SURVEY

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Birch Creek
Interagency Stream Habitat Survey

Introduction

Birch Creek is one of the four known streams in Utah which support essentially pure populations of the Utah cutthroat, Salmo clarki subsp., a once widely distributed native trout of Utah in ancient Lake Bonneville during the Pleistocene Epoch. This species has been eliminated through most of its historic range through demands on water from irrigation diversions, land uses, and hybridization with introduced Salmonid species.

The purpose of this survey was to ascertain information on this species in a joint cooperative effort by the Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and the Utah Division of Wildlife Resources. This was deemed necessary since the 1973 Red Book classified this species as "Status undetermined". Species in this category have been suggested as possibly threatened, but without sufficient information to establish its status.

Some limited aquatic data was available on Birch Creek from 1958 surveys and by the DWR as shown in Appendix IV.

In September, 1973, Dr. Robert Behnke, FWS, Colorado Cooperative Fishery Unit in cooperation with Dr. Clair Stalnaker, FWS, Utah Cooperative Fishery Unit, and the DWR made the first sample collections of this species for taxonomic and genetic analysis (see map in Appendix I and report in Appendix II. An additional status paper by Dr. Behnke on Salmo clarki Utah detailing the importance of this subspecies is presented in Appendix III. Based on the data gathered by the FWS, it was deemed necessary to conduct further investigations into this species and its habitat status. On May 1, 1974, a reconnaissance survey was made of portions of Birch Creek to determine methodologies needed to ascertain aquatic conditions. Interagency personnel present on this survey were:

Ken Satterfield - BLM, Fillmore
Don Duff, BLM, USO, Salt Lake City
Bob Gervais, USFS, Richfield
Mike Dunbar, DWR, Delta
Othello Riley, DWR, Beaver

Photographs taken during this initial survey are shown in Appendix V.

Following this initial survey, a detailed physical habitat and species population survey was initiated on June 26, 27, 1974 by interagency personnel. Participants included in all or portions of this survey work were:



Ervin Larsen, BLM, Fillmore
Don Duff, BLM, Salt Lake City
Bob Gervais, USFS, Richfield
Bruce Reece, USFS, Richfield
Don Dunham, USFS, Ogden
Charles Thompson, DWR, Provo
Blaine Dabb, DWR, Provo
Don Archer, DWR, Cedar City
John Salverlakis, DWR, Cedar City

Description

Birch Creek is a small tributary stream of South Creek, and the Beaver River. It is a perennial stream of about 10 miles, six miles occurring on the Fishlake National Forest (Beaver Ranger District), and four miles on national resource lands (NRL), of the Fillmore District, Beaver Resource area. During late summer in dry years, it has been known to go dry in its lower canyon area, some 2-3 miles downstream from the BLM-FS boundary.

However, once emerging from its canyon mouth and crossing the South Creek road 3260, it is diverted from its natural channel on NRL and flows through private and state land in an irrigation ditch, a length of about one mile before re-entering South Creek. The irrigation ditch and its re-entry into South Creek off of a steep hillside (about one half mile downstream from its natural channel mouth) as well as its intermittent status in dry years in this lower reach, create and maintain a physical barrier to any fish movement upstream into Birch Creek.

Vegetative components in the area range from a pinyon-juniper ponderosa pine type at its canyon mouth (elev. 6400 feet) to a spruce-fir-aspen type in its headwater reaches (elev. 9000+ feet). In addition, numerous types of riparian vegetation abound including oak brush, willow, cottonwood and aspen.

A wildfire occurred on the south facing slopes adjacent to and encroached on Birch Creek in June, 1971, covering about 185 acres, and located about one mile below the BLM-FS boundary.

Areas and locations described above are shown on the map in Appendix I.

Livestock grazing is presently permitted along Birch Creek, within the South Creek (upstream) and Lee Springs (downstream) allotments by BLM. Approximately 160 (251 AUMs) and 639 (1245 AUMs) head of cattle respectively occupy the area. The season of use is May 1 to October 31 and March 1 to February 26 respectively for these two allotments administered by BLM. On the Fishlake National Forest allotment 507 head of cattle are under permit on Forest land from June 1 through October 15.



Methodology and Objectives

Since Birch Creek has national significance in that it is inhabited by the unique Utah cutthroat, the survey objectives were designed to determine on BLM and USFS reaches:

1. The physical aquatic habitat present, their classes and conditions, including water quality, as they presently exist within the basin.
2. The existing fisheries standing crop, or an estimate of the present population composition existing within the various stream reaches.
3. Management recommendations for interagency administrative consideration for the protection, enhancement, and management of the Birch Creek aquatic habitat and the Utah cutthroat.

The physical habitat stream survey was made using the procedures outlined in the BLM draft, Utah State Office manual supplement 6670 - Aquatic Studies. This procedure is basically a U.S. Forest Service Region 4 method, with supplemental additions from USFS Regions 1 and 3 stream survey techniques. This survey method was developed taking existing USFS methodology and modifying and adding sections to enhance data collections on NRL and is presently being reviewed and tested for use as an interagency methodology for aquatic habitat surveys by BLM, USFS, and DWR personnel in Utah. ^{1/}

During an interagency review of this methodology in Salt Lake City, April 1974, it was recommended this procedure be used on Birch Creek by interagency personnel to evaluate its effectiveness.

Results

Physical Habitat Survey

The survey of June 27, 28, 1974, covered the 10 mile reach of Birch Creek beginning at its canyon mouth (at South Creek road crossing) on NRL and terminating on the south and north forks of Birch Creek on national forest lands.

A total of eight survey stations (4 on NRL and 4 on USFS) each consisting of five stream transects were established. These 40 transects covered the major physical habitat and vegetative components of within the reaches of Birch Creek from elevations of 6400 feet to 8200 feet.

A summary of the data collected on NRL and USFS is presented in Table I. The results of each habitat factor are summarized and expressed in terms of an optimum habitat rating for the stream. ^{1/}

In addition, habitat data collected on each of the four survey stations on NRL and USFS lands are summarized separately in Tables II and III respectively to show the varying conditions of the habitat components occupying stream reaches with different physical geomorphology and management uses. Table IV shows summaries of these data for BLM & USFS by individual station.

^{1/} Appendix V shows the initial USFS preliminary report on the results of the survey. Tabular results shown therein do not agree with the station transect figures presented herein due to differences in data evaluation. Results shown in this report were compiled following proposed interagency stream surv.crit.



Table V shows the results of stream temperature data obtained by the BLM using a Ryan 45-day continuous strip chart recorder. The unit was secured in Birch Creek on NRL immediately downstream from the BLM-USFS boundary and depict water temperatures from June 26 to October 19.

Each of the eight stations will be analyzed separately using criteria outlined in the BLM draft 6670 manual, which include analysis of pool/riffle ratio and quality, desirable stream bottom materials, and bank cover and stability rating (similar to USFS procedures) which refers to the ideal condition of a particular habitat factor for physical and biological productivity. Analyses of the four USFS survey stations are included herein using the same criteria for those four analyzed on NRL,

Station No. 1 - BLM

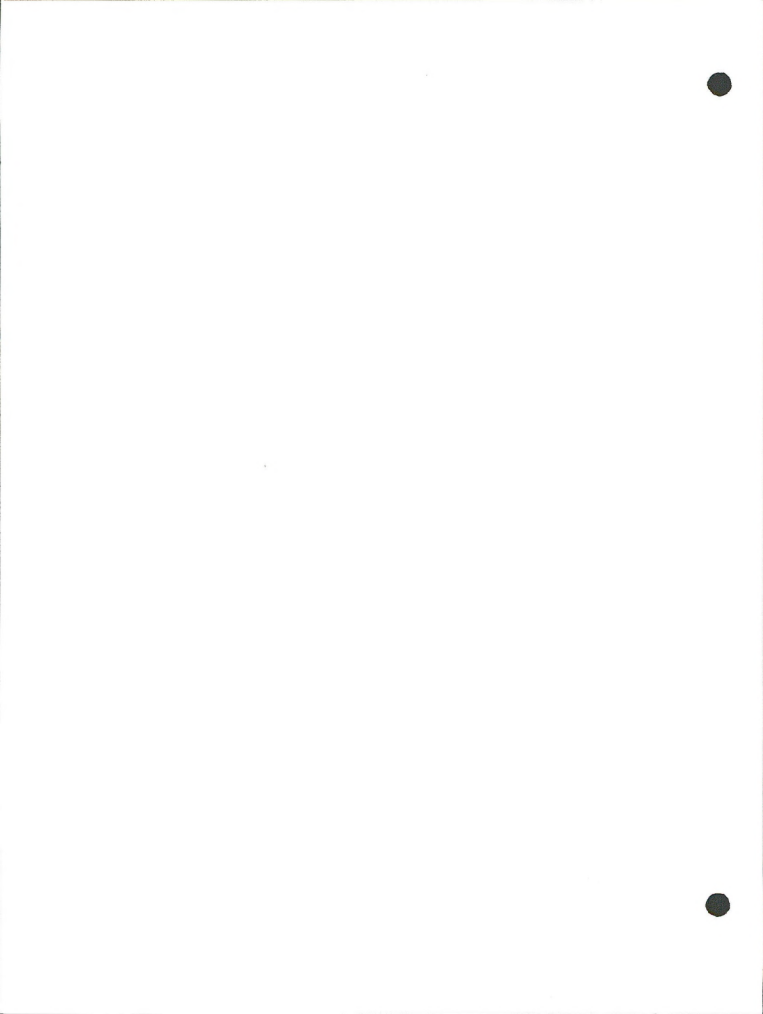
This station (S-1) is located about 1/2 mile upstream from South Creek Road crossing. The area is lightly used by livestock, but this use is responsible for elimination of most of the riparian vegetation. The station had a 42.5% and 90% optimum habitat in bank cover and stability respectively. Increased grazing pressure could lead to a lowering of the bank stability rating. Spawning and food producing gravels were abundant throughout the station but were covered with a fine layer of silt. Gravels were generally porous and loose except where areas of bedrock occurred. The pools, of which only 37% were quality pools in classes 1,2, or 3. Stream improvement structures would aid in enhancing pool quality in this area if the stream is perennial at this point. In dry years, the stream is reportedly dry in this section. Structures could possibly aid in providing carryover pools for fish caught in this intermittent section during dry seasons of short duration.

Above Station No. 1 the stream meanders through a "rough" canyon with large cottonwood trees and oak, pine and other riparian vegetation. It is virtually inaccessible and unused by livestock. The streambank cover and stability is excellent and many class 2 and 3 pools are present. No fish were observed in Station No. 1 or in this canyon area, however, fish could be present, even in carryover pools during short dry seasons. The stream is shaded 90-100% of the time in this canyon.

Within this canyon area, about 1/2 mile above S-1, is a six foot high barrier falls made up of natural debris (see photo appendix, photo no. 5). This would provide a barrier to upstream migration of cutthroat or exotic species below the barrier. The barrier is natural, but is not 100% stable. A severe flash flood or excessive stream flow could possibly wash the barrier out. It could be stabilized to provide a permanent barrier with little time and effort expended for management.

Station No. 2 - BLM

This station is located about 1 1/2 stream miles above S-1 at the upstream end of the cottonwood canyon and the beginning of the willow-sagebrush-juniper zone. It is characterized by excellent habitat, the best surveyed



on national resource land (NRL) on the creek, as shown in Table IV. Bank cover and stability are both over 75% and while the area is accessible to livestock, few have grazed this far downstream. Heavy riparian vegetation zones along the creek prevent cattle from impacting this section severely, however, increased grazing in the area could lead to the degradation of this habitat.

Water quality at S-2, as was at S-1, was fair to poor with the water a slight turbid milky color and streambed gravels covered with a fine layer of silt. The siltation in this area, as well as S-1, combined with probable excessive water temperature and low discharge during the late summer could cause trout mortality here.

Above S-2, the area contains 4-wheel drive trails where trespass post cutting has and is still being conducted. In some cases P-J debris is in the stream channel. Streambank cover and stability is degraded in several reaches from this trespass cutting and the resulting erosion and siltation is having an impact on downstream habitat.

Station No. 3 - BLM

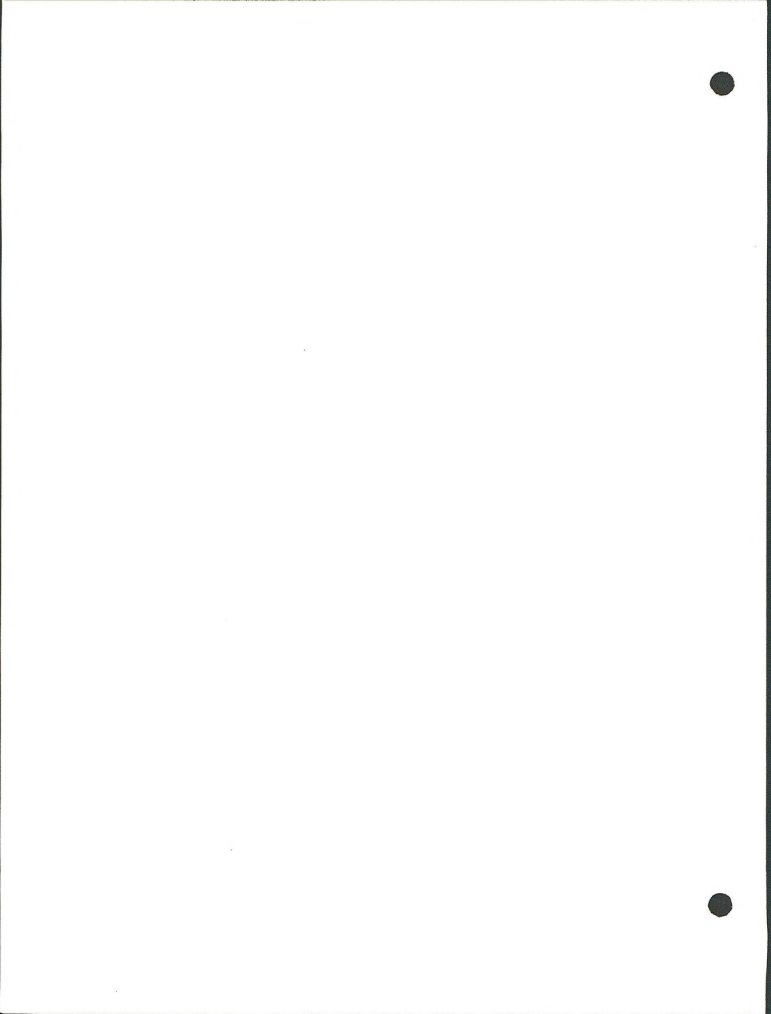
Station S-3 is located at the downstream end of the 1971 wildfire burn that impacted the creek. A very low total optimum habitat rating of 48% is present. Excessive livestock grazing in this area has prevented the establishment of riparian bank cover throughout the area, and is reflected by a water temperature of 82°F and zero percent daylight streamside shade.

Although bank stability received a 70% optimum rating due to low grassy banks, this reach is far more susceptible to degradation than the figure implies. Bank areas within S-3 and many above S-3 are contributing silt and sediment into the stream. The immediate streambank meadow zone is heavily trampled by livestock. This loose soil enters the stream during each storm event and contributes significantly to the stream's degradation. Some 30 head of livestock were found grazing in the streambank zone during this survey.

Station No. 4 - BLM

Station S-4 is located about 1/4 mile below the USFS boundary and at a road crossing established during the 1971 wildlife burn. It is still in use by recreationists and trespass post cutters. The road traversing the reach from the USFS boundary to S-4 impacts the creek in the S-4 area for about 100 feet, as it and the streambed occupy the same path. Because of the road in the creek and high flows, the flood plain channel is wide resulting in poor pool habitat.

There were no class 1, 2, or 3 pools in this area and pool quality was zero. Streambed gravels were numerous and useable in this reach, rating a 93% optimum condition, while other factors were low contributing to an overall 42% of optimum habitat condition.



Station No. 5 - USFS

This station was located in an area of heavy beaver activity, at its upstream limits, about 1/4 mile above the FS-BLM boundary. The beaver have been in the area for some time and with lack of management they have contributed to habitat degradation. The beaver ponds do act as silt catchment and detention basins for upstream sediments as well as serving to increase surface water temperatures.

The area within S-5 flows within a very narrow and eroded channel with raw banks reaching 12 feet in height. Most of the stream area was pool formed by the beaver dams and the pool riffle ratio was a low 38%. Pool quality was poor being only 33% due to gradient, narrow channel, and sediment accumulations. Bank cover was 93% mainly from aspen overstory, but bank riparian vegetation was absent in most cases on raw or eroded banks.

Above this station was the remnant of a once active beaver pond area, now filled in with silt and sediment and void of tree cover. The stream meandered through this reach with quality pools absent and water temperatures in the 70's°F.

Station No. 6 - USFS

S-6 was located about 1/2 mile above S-5 at elevation 7640 in an open sagebrush-aspen meadow above FWS electrofishing station F-1 and the junction of the Twist Creek road with the creek. The pool riffle ratio was 80% optimum and pool quality was up to 53% of optimum, but bank cover had been depleted from grazing use and was very low at 35%.

While streambottom gravels were rated 100% desirable for food producing organisms they were not all useable by cutthroat as many were heavily sedimented. Bank stability was up to 63% from 55% at S-5, but still show the impacts from grazing use. Although many habitat components were degraded this station rated 60% of total habitat optimum and was the best on national forest land.

This reach contained many small cutthroat despite degraded habitat and was the reach area where the original collection was made in 1973 by the USFWS.

Station No. 7 - USFS

S-7 was located at 8200 feet elevation on the South Fork of Birch Creek at its junction with the North Fork. The surrounding terrain was steep and forested with a stream gradient of 7.2%. The measured streamflow on June 27 was 0.1 c.f.s.

The steep gradient, low flow and small channel are limiting factors to usable trout habitat in this reach. However, total habitat rated 56% of optimum. Bank cover and stability rated well at 70% and 83% respectively. However, the cover rating would have been higher, but T-1 and T-2 traversed an open meadow area receiving grazing use which eliminated riparian cover.



Water quality was excellent and temperatures were optimum at 54°F. The area's habitat prime value appears that of being a rearing and nursery area for juvenile cutthroat.

Station No. 8 - USFS

S-8 is located also at 8200 feet elevation on the North Fork of Birch Creek at its junction with the South Fork. The streamflow measured 0.3 c.f.s. and habitat values rated 9% lower than the South Fork due to gradient, narrow channel and unstable bank conditions from grazing use and high flows. While some pools did exist in this reach they were low quality and no class 1,2, or 3 pools were observed. The pool riffle ratio rated 34% while pool quality rated zero.

This reach has similar limiting factors to the South Fork and appears to be of the same value to the cutthroat in providing good water quality and nursery area.

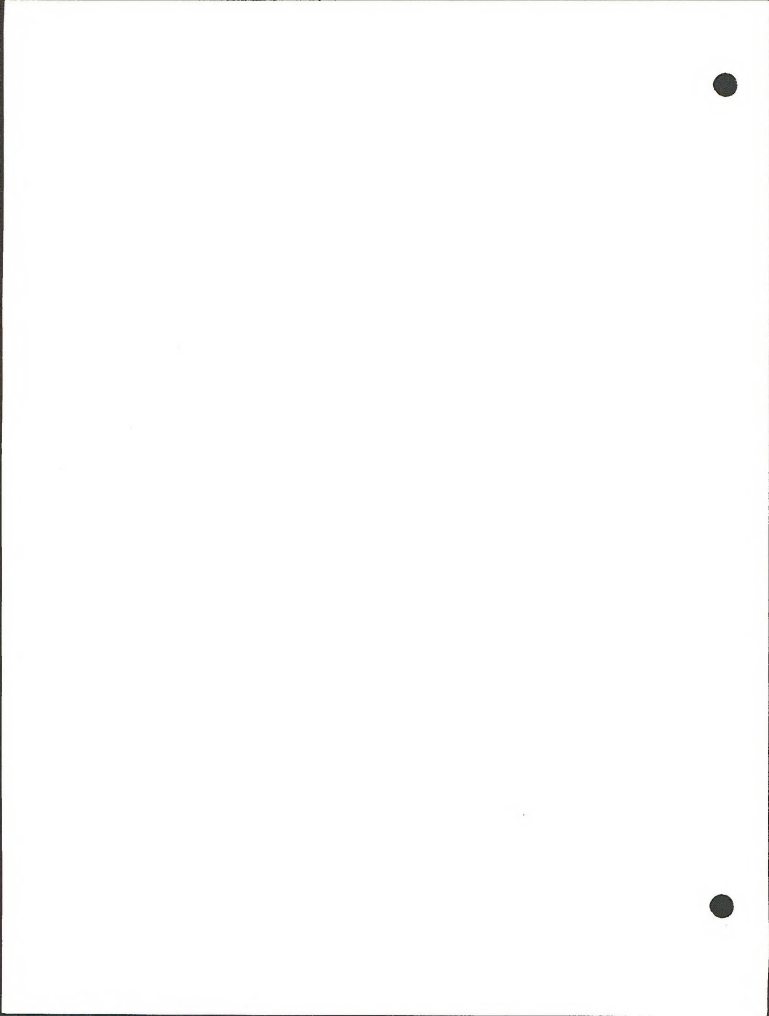
Electrofishing Survey Results

Table VIII shows the results of DWR electrofishing with one station on BLM and two on the USFS.

The results of trout population estimates made by the DWR show that trout numbers decrease in the lower reaches of Birch Creek. In the stretch of stream just below the confluence of the North and South Forks the population is greatest at 43.2 pounds per acre. This is an above average standing crop value and indicates a relatively high basic productivity characteristic of Birch Creek drainage.

The sample taken in the vicinity of Station No. 6 shows a figure of 21.4 pounds per acre, 14.4 pounds per acre was observed just below the Forest boundary. The occurrence of these decreasing population levels correlate very well with the degree of impact other uses are having on the stream. The highest standing crop value is found in the stretch where relatively little use occurs on the stream. The area is forested with a low level of cattle use and no road access. The area supporting 21.4 pounds was located just above Station No. 6. Cattle congregate heavily in this area and consequently it provides the lowest habitat value of any of the stations. Bank vegetation was especially lacking here so water temperatures would increase substantially through this area.

The lowest value of 14.4 pounds was found on NRL just below the Forest Service-BLM boundary. This area is below the beaver ponds and receives the silt load that is caused by cattle utilizing the riparian stream area between Stations No. 6 and No. 5. No trout were observed below this point on the stream even though there was an additional two or three miles of flowing water. Excessive water temperatures and a high degree of siltation are the limiting factors making this area suitable as trout habitat at the present time. Improving upstream USFS watershed conditions by reducing the effects other uses are having on the stream and riparian areas would probably result in the entire stretch of stream on BLM land becoming productive trout habitat.



Discussion

The over-all limiting factors in the aquatic habitat of Birch Creek are the low streamflows which occur during the summer months, and high water temperatures occurring at the lower end of the drainage resulting from losses of riparian vegetation from cattle use. Measurements on June 27 and October 7 at the Forest Service-BLM boundary showed the flow to be 0.52 c.f.s. and 0.25 c.f.s. respectively. 1974 thermograph records (Table V) show that water temperatures can exceed 65°F by mid-June at the USFS-BLM boundary to reach a maximum of 72°F by mid-August.

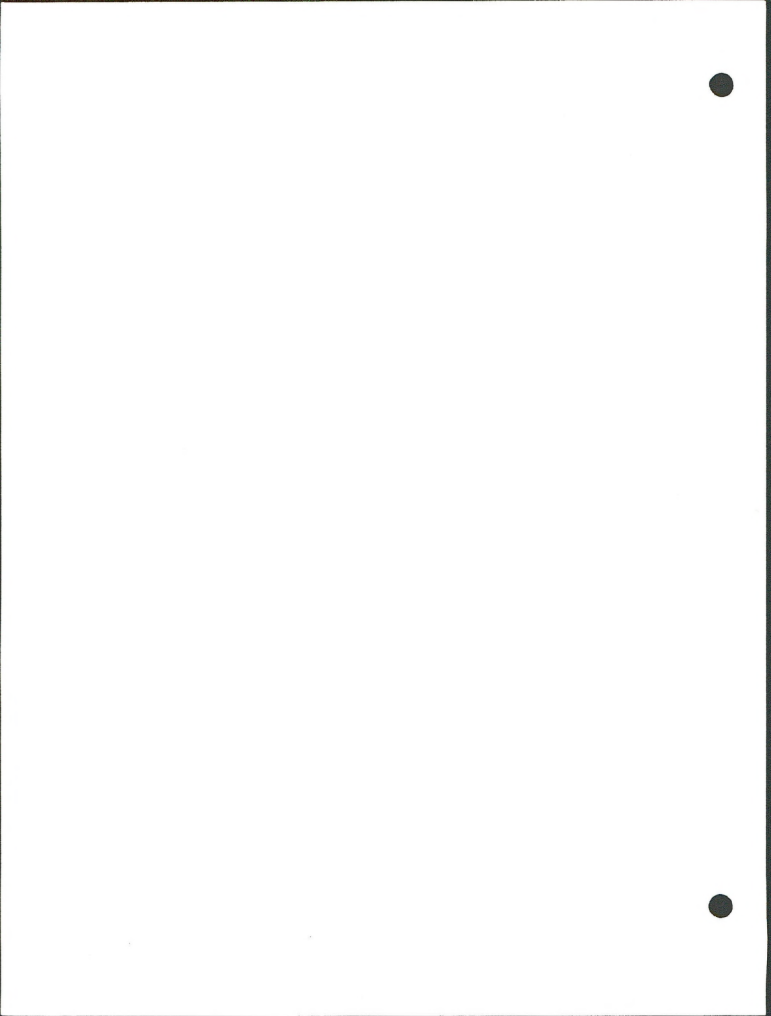
Other major factors which affect habitat quality of the stream are (1) livestock grazing use on the watershed, (2) a poor quality BLM-USFS road which runs adjacent to the stream for two miles, (3) a beaver colony on the National Forest using the stream about half a mile above the USFS-BLM boundary, and (4) natural hydrologic actions of the stream in degraded reaches including bedload movement and channel meander.

The grazing use of the drainage by livestock is concentrated on the lower reach of the stream on NRL at Stations No. 3 and No. 4 and on Forest land primarily on Stations No. 5 and No. 6. The effects of this use are shown in a greater incidence of unstable banks and decreased bank cover in these areas. The average values at the BLM Stations (where cattle use was concentrated) for bank cover and stability were 52 and 36 percent of optimum habitat respectively. For the upper stations these values were 81 and 55 percent.

There were no measurements taken of the suspended sediments in the stream, but it was visually noticeable that when cattle were using the area the water was more turbid. In addition to causing reductions in macroinvertebrate food producing areas and spawning areas, turbidity also causes increased stream temperatures.

The primary impacts of the road paralleling Birch Creek are in unstable banks and increased suspended sediments coming from the road during summer storms or spring snow melt. BLM Station No. 4 was in an area where the road encroached on the streambank and direct measurements of increased bank instability were recorded. This characteristic was clearly observed while inspecting the stream reaches outside the transect area and further upstream in the drainage. At one point on the stream (between USFS Stations No. 6 and No. 7) the stream actually leaves its natural channel and courses for about a quarter of a mile down the roadbed. This area is unstable during high flows and probably results in a substantial increase in the sediment load of the stream.

Beaver activity is another problem area degrading the quality of habitat on Birch Creek. It is generally accepted that beaver activity enhances the quality of trout habitat on a stream. In the case of Birch Creek, however, increased beaver populations without management are causing degradation of the water quality and riparian vegetation. The ponding of water behind dams with slower water velocities and greater surface area exposed to sunlight from loss of bank vegetation as aspen are cut results in increased



stream temperatures. Also, high turbidity levels in the ponds add to the warming effect and increase downstream sedimentation. Finally, as the beaver settlements are abandoned, highly unstable areas are left behind. These areas then take years to develop into productive habitat acres again.

Past uses of the watershed have caused damages to the stream which are still evident today. Bank cutting and erosion are occurring in some areas and in others the channel is building up with regrowth of vegetation. The causes of these changes occurred around the turn of the century when overuse of watershed rangeland was common. This past use has resulted in the present unstable conditions. In recent years, however, this situation has been reversed and with the use of current range management techniques the watershed should undergo a gradual recovery and improvement. This, in turn, will lead to improved instream conditions if grazing systems and management decisions are made or changed for the benefit of the critical resource perpetuation.

Recommendations

Based on the results of this interagency stream habitat undertaken to inventory aquatic habitat, fisheries, watershed conditions on Birch Creek, the following recommendations are made to assure the enhancement, management, and protection of the aquatic habitat and survival of this rare and unique Utah cutthroat:

- (1) BLM and USFS should develop grazing systems for the watershed to provide for the recovery of riparian vegetation and streambank stability. This may require the installation of off-stream stock watering troughs and fencing to prohibit livestock from congregating on the stream.
- (2) In order to minimize sediment delivery from the road into the creek close to those portions of the BLM-FS road which are providing impact to the creek, the road should be closed or relocated in these impact areas.
- (3) BLM and USFS should provide for rehabilitation of the soil and vegetative cover of the streambank and the existing road in the areas where the road will be closed.
- (4) Active and inactive beaver dams should be partially breached and allowed to deteriorate naturally. Clearance of stream channel debris from beaver cuttings should be accomplished to allow for stream and vegetative recovery.
- (5) BLM should intensify efforts to stop trespass post cutting along stream from Stations S-4 to S-2. Road closure could reduce or eliminate this problem.
- (6) USFS should coordinate with DWR to remove beaver from the creek area. Existence of beaver colonies cannot be allowed in this marginal habitat situation.



(7) BLM, USFS, and DWR should provide construction of instream improvement structures and bank plantings to aid in streambank habitat rehabilitation and provide survival cover for the cutthroat at low flows and high water temperatures.

(8) BLM should provide for the stabilization of the natural barrier falls in the cottonwood canyon area between Stations S-1 and S-2 to provide for a permanent type barrier falls which will aid in the future survival of the Utah cutthroat.

(9) BLM, USFS, USFWS and DWR should coordinate annually to provide for followup aquatic habitat and water quality surveys as well as fish population surveys as needed. Some of these aspects are needed annually for the next five years to determine status of habitat recovery and Utah cutthroat survival in Birch Creek. 1975 field surveys should include:

a. Documentation of fish status from BLM Station S-3 upstream in the spring, and stream and fish status in the fall at intermittent streamflow stages.

b. Monitoring of water quality, temperature, and streamflow measurements in the spring-fall with Ryan thermographs placed at BLM-FS boundary by BLM and at S-7/S-8 by USFS, and placement of maximum-minimum thermometers in BLM Station S-3 wildlife burn area. Begin surveys for benthic macroinvertebrates to provide data correlation with land uses and water quality.

(10) Consider the use of color infrared photography to document existing habitat conditions, and provide a means of evaluating future habitat recovery.

(11) BLM and USFS began development of habitat management plans in coordination with DWR and FWS with end result in the future being a joint HMP for the watershed and species management.

The purpose of this survey was to determine what should be done in watershed management practices to rehabilitate and protect the fishery and water quality habitat of Birch Creek for the management, protection and enhancement of the Utah cutthroat and its habitat. Any program to accomplish this should include the coordinated efforts of each of the agencies involved in the survey. This would permit management of the stream as a unit rather than segmented portions. Benefits to stream habitat would be correspondingly greater if a coordinated program was used.

Proper land management practices on the watershed could make the entire length of Birch Creek productive trout habitat in the future. In the event that the Utah cutthroat trout is declared officially an endangered or threatened species the area would be used as a source of pure strain fish to be planted in other drainages. In that case the entire productive capacity of the stream would be needed.

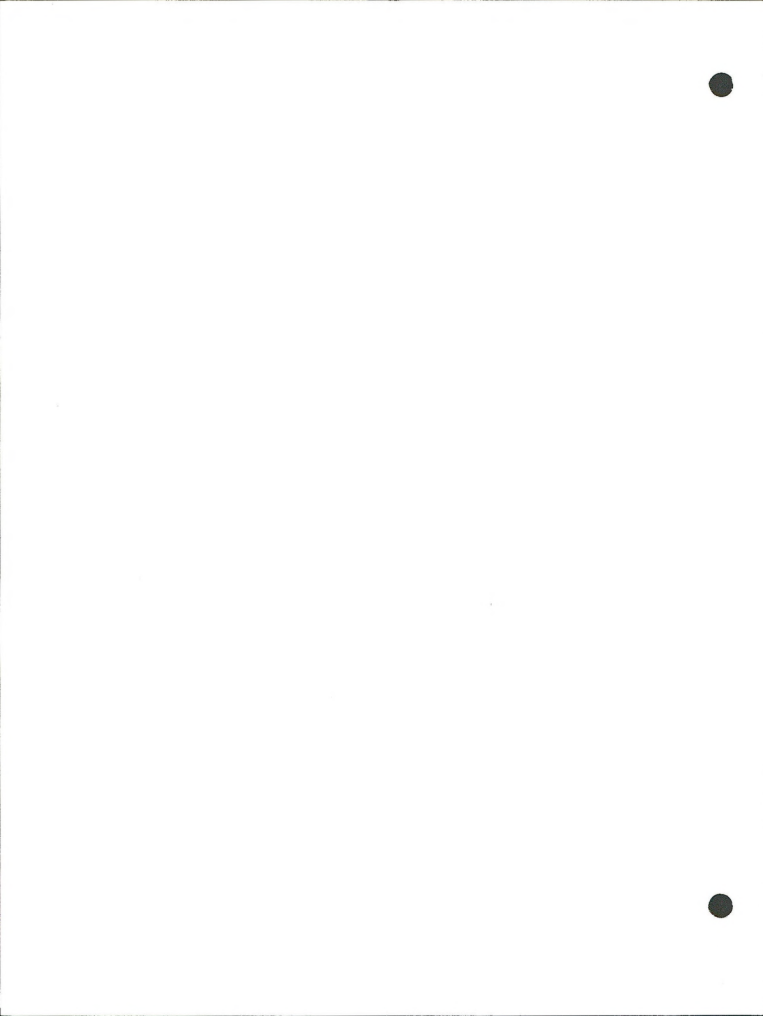


TABLE I
STREAM HABITAT SURVEY SUMMARY AND ANALYSIS
 (BLM & USFS)

1. State -- County Utah Beaver	2. District Fillmore(BLM);Beaver(USFS)	3. Resource Area -- P.U. Beaver(BLM); Tushar(USFS)
4. Drainage Beaver River	5. Stream Unit Birch Creek	6. Location T. 30S. R. 6W. Sect. 9
7. Investigators Duff-Larsen(BLM); Gervais-Reece(USFS)		8. Date June 26,27, 1974
General Data		Priority A Limiting Factors
9. Total length of stream (mi.)	<u>10</u>	23. Percent of total stream width in pools <u>50</u>
10. Total length of stream surveyed (mi.)		24. Pool-riffle ratio, % optimum <u>100</u>
a. BLM	<u>4</u>	25. Pool quality, % optimum <u>65</u>
b. Public USFS	<u>6</u>	Pool structure <u>36</u>
c. Private	<u>0</u>	26. Percent of streambottom with desirable materials <u>95</u>
11. Total No. sample stations:		27. Bank cover, % optimum <u>61</u>
a. BLM	<u>4</u>	28. Bank stability, % optimum <u>74</u>
b. Public	<u>4</u>	29. Percent of habitat optimum <u>80</u>
c. Private	<u>0</u>	
12. Total of all stream width measurements (ft.)	<u>181</u>	
Total channel width (ft.)	<u>324</u>	
13. Total width - all pools (ft.)	<u>91</u>	Priority B Limiting Factors
14. Total width of all pools classed 1, 2, and 3 (ft.)	<u>59</u>	30. Average depth of stream (ft.) <u>0.23</u>
15. Total footage of desirable bottom materials (ft.)	<u>172</u>	31. Average width of stream (ft.) <u>4.3</u>
Total spawning gravels (ft.)	<u>70</u>	Percent stream shaded <u>39</u>
16. Sum of cover ratings	<u>194</u>	32. Percent of bottom with clinging vegetation (ft.) <u>0</u>
17. Sum of stability ratings	<u>236</u>	Percent sedimentation <u>32</u>
18. Elevation: (m.s.l.)		33. Percent of bottom with rooted vegetation (ft.) <u>< 1</u>
a. Lowest	<u>6400</u>	34. Average stream gradient (%) <u>3.9</u>
b. Highest	<u>9000</u>	Percent Landform gradient <u>RB 18</u>
19. Multiple use zones	<u>water</u>	35. Average stream velocity (f/s) <u>1.1</u> <u>LB 17</u>
	<u>recreation</u>	36. Stream discharge (c.f.s.) <u>0.8</u>
20. Number of camera points	<u>8</u>	37. Average water temperature: water <u>61</u>
21. Total cost		°F <u>air</u> <u>80</u>
a. Planning	<u>\$169</u>	38. Turbidity description <u>clear-milky</u>
b. Salaries	<u>424</u>	39. Access: (mi.)
c. Equipment	<u>0</u>	a. Remote <u>4</u>
d. Analysis of data	<u>340</u>	b. Low standard trails <u>2</u>
22. Cost per station	<u>117</u>	c. Improved trails <u>4</u>
		d. Low standard roads <u>4</u>
		e. Improved roads <u> </u>
		40. Water quality analysis:
		a. Hach kit <u>x</u>
		b. Chemical (state) <u> </u>
		c. Coli (state) <u>x</u>

(over)



TABLE II
STREAM HABITAT SURVEY SUMMARY AND ANALYSIS
 BLM STREAM SUMMARY

1. State -- County Utah Beaver	2. District Fillmore	3. Resource Area -- P.U. Beaver
4. Drainage Beaver River	5. Stream Unit Birch Creek	6. Location T. 30S. R. 6W. Sect 6-7-8-9
7. Investigators Duff-Larsen (BLM); Cervais (FS)		8. Date June 26, 1974

General Data	Priority A Limiting Factors
9. Total length of stream (mi.) <u>10</u>	23. Percent of total stream width in pools <u>38</u>
10. Total length of stream surveyed (mi.)	24. Pool-riffle ratio, % optimum <u>76</u>
a. BLM <u>4</u>	Pool structure, % opt. <u>16</u>
b. Public USFS <u>6</u>	25. Pool quality, % optimum <u>41</u>
c. Private <u>0</u>	
11. Total No. sample stations:	26. Percent of streambottom with desirable materials <u>93</u>
a. BLM <u>4</u>	27. Bank cover, % optimum <u>47</u>
b. Public <u>4</u>	28. Bank stability, % optimum <u>82</u>
c. Private <u>0</u>	29. Percent of habitat optimum <u>66</u>
12. Total of all stream width measurements (ft.) <u>92</u>	
Total channel width (ft.) <u>185</u>	Priority B Limiting Factors
13. Total width - all pools (ft.) <u>35</u>	30. Average depth of stream (ft.) <u>0.2</u>
14. Total width of all pools classed 1, 2, and 3 (ft.) <u>19</u>	31. Average width of stream (ft.) <u>4.4</u>
15. Total footage of desirable bottom materials (ft.) <u>82</u>	Percent stream shaded <u>25</u>
Total spawning gravels (ft.) <u>33</u>	32. Percent of bottom with clinging vegetation (ft.) <u>0</u>
16. Sum of cover ratings <u>75</u>	Percent sedimentation <u>24</u>
17. Sum of stability ratings <u>131</u>	33. Percent of bottom with rooted vegetation (ft.) <u>< 1</u>
18. Elevation: (m.s.l.)	34. Average stream gradient (%) <u>33</u>
a. Lowest <u>6400</u>	Percent landform gradient <u>RB 23</u>
b. Highest <u>7240</u>	35. Average stream velocity (f/s) <u>1.5</u> <u>LB 21</u>
19. Multiple use zones _____	36. Stream discharge (c.f.s.) <u>0.7</u>
20. Number of camera points <u>4</u>	37. Average water temperature: water 68 of air <u>83</u>
21. Total cost	38. Turbidity description <u>clear-milky</u>
a. Planning <u>113</u>	39. Access: (mi.)
b. Salaries <u>240</u>	a. Remote <u>4</u>
c. Equipment <u>0</u>	b. Low standard trails _____
d. Analysis of data <u>248</u>	c. Improved trails _____
22. Cost per station <u>150</u>	d. Low standard roads <u>2</u>
	e. Improved roads _____
	40. Water quality analysis:
	a. Hach kit <u>x</u>
	b. Chemical (state) _____
	c. Coli (state) <u>x</u>

(over)

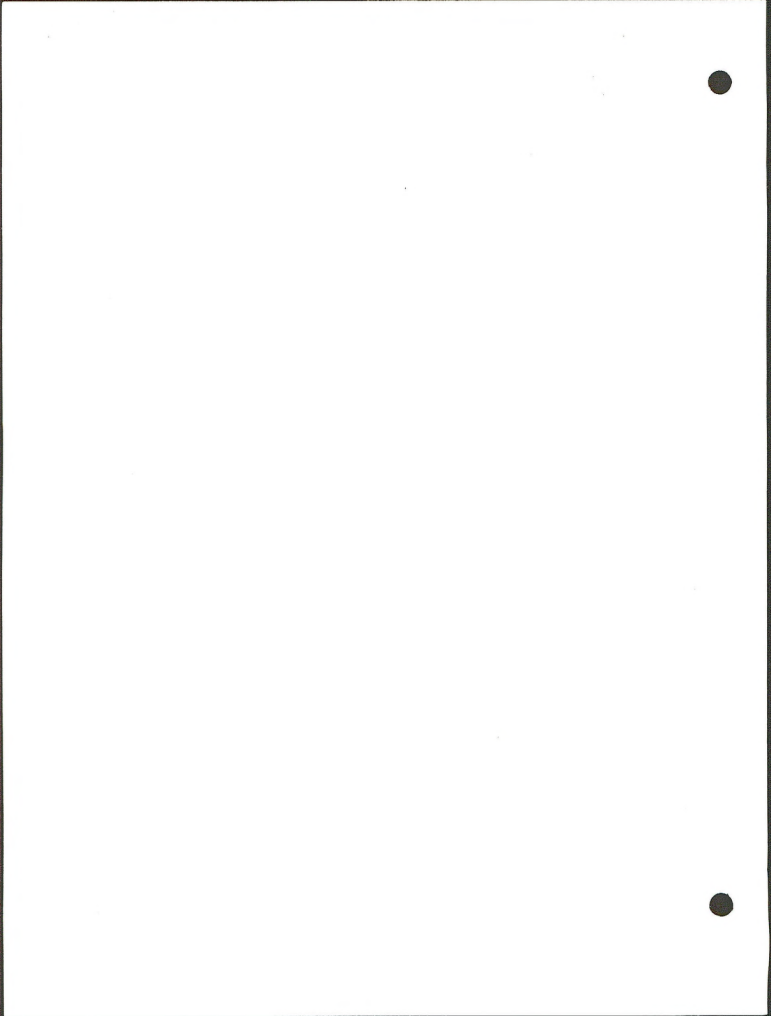
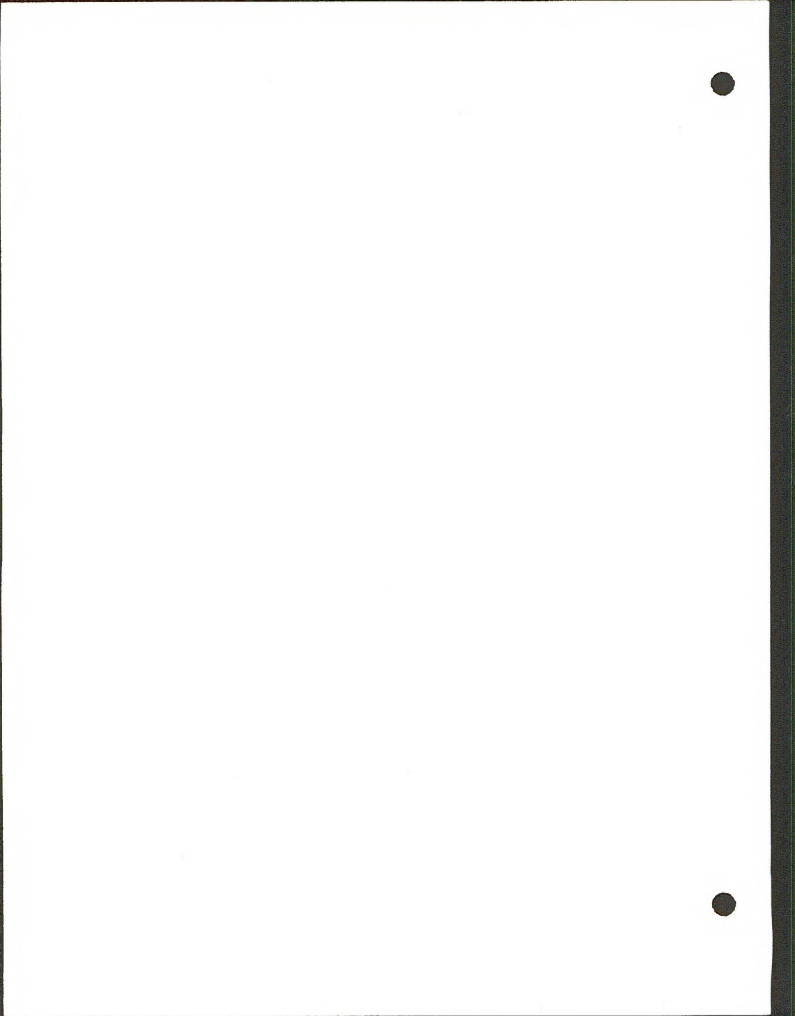


TABLE III
STREAM HABITAT SURVEY SUMMARY AND ANALYSIS
USFS STREAM SUMMARY

1. State -- County Utah Beaver	2. District Beaver	3. Resource Area -- P.U. Tushar
4. Drainage Beaver River	5. Stream Unit Birch Creek	6. Location T. 30S. R. 6W. Sect 10-11-12
7. Investigators Gervais - Reece(TS); Duff-Larsen (BLM)		8. Date June 27, 1974

General Data	Priority A Limiting Factors
9. Total length of stream (mi.) <u>10</u>	23. Percent of total stream width in pools <u>63</u>
10. Total length of stream surveyed (mi.)	24. Pool-riffle ratio, % optimum <u>74</u>
a. BLM <u>4</u>	Pool structure <u>33</u>
b. Public <u>6</u>	25. Pool quality, % optimum <u>53</u>
c. Private <u>4</u>	
11. Total No. sample stations:	26. Percent of streambottom with desirable materials <u>97</u>
a. BLM <u>4</u>	27. Bank cover, % optimum <u>74</u>
b. Public <u>4</u>	28. Bank stability, % optimum <u>66</u>
c. Private <u>0</u>	29. Percent of habitat optimum <u>77</u>
12. Total of all stream width measurements (ft.) <u>89</u>	
Total channel width (ft.) <u>178</u>	
13. Total width - all pools (ft.) <u>56</u>	Priority B Limiting Factors
14. Total width of all pools classed 1, 2, and 3 (ft.) <u>40</u>	30. Average depth of stream (ft.) <u>0.26</u>
15. Total footage of desirable bottom materials (ft.) <u>83</u>	31. Average width of stream (ft.) <u>4.2</u>
Total spawning gravels (ft.) <u>37</u>	Percent stream shaded <u>53</u>
16. Sum of cover ratings <u>119</u>	32. Percent of bottom with clinging vegetation (ft.) <u>0</u>
17. Sum of stability ratings <u>105</u>	Percent sedimentation <u>38</u>
18. Elevation: (m.s.l.)	33. Percent of bottom with rooted vegetation (ft.) <u><1</u>
a. Lowest <u>7240</u>	34. Average stream gradient (%) <u>4.6</u>
b. Highest <u>8200</u>	Percent landform gradient
19. Multiple use zones	35. Average stream velocity (f/s) <u>0.88</u>
	36. Stream discharge (c.f.s.) <u>0.5</u>
	37. Average water temperature: water <u>53</u>
	Of air <u>77</u>
20. Number of camera points <u>4</u>	38. Turbidity description clear-milky
21. Total cost	39. Access: (mi.)
a. Planning <u>56</u>	a. Remote
b. Salaries <u>184</u>	b. Low standard trails <u>2</u>
c. Equipment <u>0</u>	c. Improved trails
d. Analysis of data <u>92</u>	d. Low standard roads <u>2</u>
22. Cost per station <u>83</u>	e. Improved roads
	40. Water quality analysis:
	a. Hach kit <u>x</u>
	b. Chemical (state)
	c. Coli (state) <u>x</u>

(over)



STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah			3. District Fillmore			5. Drainage Beaver River			7. Location: T. R. Sect. T30S, R6W, Sec 6			9. Investigator: Duff/Larsen/Cervais		
2. County Beaver			4. Resource Area-P.U. Beaver			6. Stream Birch Creek			8. Survey Station S-1			10. Date 8-28-74		

Transect Number	Water Surface												Stream Bottom												Stream Bank												Stream Gradient	Velocity
	Total Width of Channel	Water Width	Riffle Width	Depths			Pools			Aquatic Plants	Bedrock	Boulders +12"	Large Rubble 6-12"	Small Rubble 3-6"	Course Gravel 1-3"	Fine Gravel 0.1-1"	Sand	Silt	Clay	Muck	Organic Debris	Left Bank			Right Bank													
				1	2	3	Avg.	Width	Class													Location	Feature	Cover	Stability	Class	Landform	Gradient	Cover	Stability	Class	Landform	Gradient					
																																		15	16	17		
T-1	8	3	-	3	3	4	0.25	3	3	ALL	Rock						3						2	4	Brush Rocks	45°	2	4	Rock Soil	45°	5	0.02						
T-2	13	5	-	1	1	1	0.07	1	5	C	-			2	2							1	3	4	Brush Trees	52°	2	4	Rock Soil	43°	3	1.1						
T-3	7	3	-	4	5	3	0.3	3	3	ALL	Depth						3					1	4	Rock Grass	53°	1	4	Rock Grass	41°	5.5	0.3							
T-4	10	4	-	2	2	2	0.15	1	5	R	-			4								2	3	Rock Soil	50°	2	3	Rock Soil	58°	5.5	1.6							
T-5	6	4	-	3	5	5	0.3	4	4	ALL	Rock			1	2	1						1	3	Rock	52°	1	3	Rock Grass Emul	33°	-	0.6							
	44	19					0.21/12							7	2	2	1	6				1	9	18		252	8	18		220	4.7	0.72						
																										50.4				44								

45. Access foot-remote 46. Water Temperature 57° 47. Air Temperature 79° 48. Time 9:50 a.m.

49. Elevation 6500' 50. Turbidity clear 51. Water Analysis: Hach Kit X Chemical (State) Coli (State)

52. Water Quality Class (State) CC 53. DWR (State) Fishing Water Class 6 54. DWR (State) Stream Catalog No. 55. MU Zone remote

56. Land Type 9 57. Vegetative Type P-J Section No. VI.B.5.a.(1) 58. Discharge (c.f.s.) 0.33 VHR 59. % Stream Shaded 50

Larsen - Recorder
DWR catalog - pg. 42

59. General Remarks

Station 1 located upstream from South Creek Road crossing in narrow boulder face section on stream. Referenced to 3" pinon pine on right bank, wood stake behind tree; gambel oak on left bank opposite; orange paint marks point also.

Photo taken looking upstream.

T-1 100 ft. upstream from reference point on right bank, 4 feet from 2" pinon tree. Orange paint on rock at edge of bank.

T-2 located 100 feet upstream from T1, stake on right bank. Orange paint on rocks on both sides of the stream. Stake above pinon tree and stump on right side of stream.

T-3 located 100 feet upstream from T2. Stake on right bank - orange paint on rocks on both sides of stream and T3 in orange paint on tree stump on left bank. Tree photos taken (photo station).

T-4 located 100 ft upstream from T3. Stake on right bank and 4 ft down stream from juniper tree.

T-4 located 100 ft upstream from T4. Stake on right bank on grass bank in small maadow area. Orange paint on rocks on left bank.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah		3. District Fillmore		5. Drainage Beaver River		7. Location: T. R. Sect. T30S, R6W, Sec 8		9. Investigators Duff, Gervais, Larson	
2. County Beaver		4. Resource Area-P.U. Beaver		6. Stream Birch Creek		8. Survey Station S-2		10. Date 6-26-74	

Transect Number	Water Surface												Stream Bottom												Stream Bank												Stream Gradient	Velocity
	Total Width of Channel		Water Width		Riffle Width		Depths			Pools			Aquatic Plants	Bedrock	Gravel 12"	Large Rubble 6-12"	Small Rubble 3-6"	Coarse Gravel 1-3"	Fine Gravel 0.1-1"	Sand	Silt	Clay	Rock	Organic Debris	Left Bank			Right Bank										
							1	2	Avg.	Width	Class	Location													Feature	Cover	Stability	Class	Landform Gradient	Cover	Stability	Class	Landform Gradient					
	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.				
1	6	4	3	2	3	1	1.5	1	5	LB	rock				3									1	4	4	Willow	10%	3	4	Willow	18%	1.5%	5				
2	5	5	-	3	1.0	5	1.45	5	2	all depth										5				2	3	Willow grass	6%	3	3	Willow grass	16%	1.2%	2					
3	3	3	-	4	0.8	8	1.5	3	2	all depth								1	1				1	3	3	W grass	5%	3	4	W	18%	1.2%	2					
4	6	4	-	2	2	2	1.5	1	5	LB	-			4										3	4	grass	6%	3	4	W	18%	1.3%	2					
5	6	2	2	1	2	1	1	0			-							2						3	3	grass	6%	3	3	grass	16%		2					
	26	18	5				27	10						7				3	6				2	15	17		33	15	18			17.2	.3	2.6				

45. Access foot-remote 46. Water Temperature 65°F 47. Air Temperature 80°F 48. Time 1130

49. Elevation 6900' 50. Turbidity milky 51. Water Analysis: Mech Kit _____ Chemical (State) _____ Coli (State) _____

52. Water Quality Class (State) CC 53. DWR (State) Fishing Water Class 6 54. DWR (State) Stream Catalog No. VI.B.5.a.(1) 55. MU Zone remote

56. Land Type 9 57. Vegetative Type 10-4 58. Discharge (c.f.s.) <15 59. % Stream Shaded 20-30

59. General Remarks

S-2 Referenced to three large cottonwoods on rt. bank, S-2 stake on left bank.

T-1 Between juniper on rt. bank and spruce on left bank 100' upstream.

T-3 Located 100' upstream, large boulder with T-3 on right bank.

Cattle have been in area but use not heavy due to rugged features. No fish observed.

USO 6670-1 (7/73)

45. Access remote-4whl drive 46. Water Temperature 82
 trail

49. Elevation 7050' 50. Turbidity clear

52. Water Quality Class (State) CC 53. DWR (State) Fishing Water Class
CC 6

56. Land Type 9 57. Vegetative Type 8 (old burn)

47. Air Temperature 88 48. Time 1230
51. Water Analysis: Hach Kit _____ Chemical (State) _____ Coli (State) _____
54. DWR (State) Stream Catalog No. _____ 55. MU Zone remote-hiking
Section No. VI.B.5.a.(1)
58. Discharge (c.f.s.) 21 59. % Stream Shaded 0

59. General Remarks

- T-1 Located at west edge of burned area along stream. Stake located at large dead juniper tree - Orange paint on road.
- T-2 Located 100' upstream from T-1. Orange paint on rock.
- T-3 Located 100' upstream from T-2. Orange paint marks rocks.
- T-4 Located 100' upstream from T-3. Orange paint on large juniper tree.
- T-5 Located 100' upstream from T-4. Roads marked with orange paint. Good location for photo station.

Observed 20 head cattle and calves in area. Area beat out by cattle use; no riparian cover established since fire; bank and adjacent cover limited to grass-sedge, thistle and nettle. No fish observed. Needs grazing system and bank plantings to stabilize banks. Stream structures would help pool cover.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah				3. District Fillmore				5. Drainage Beaver River				7. Location: T. R. Sec. T30S, R6W, Sec 9				9. Investigators Duff, Larsen, Gervais			
2. County Beaver				4. Resource Area-P.U. Beaver				6. Streams Birch Creek				8. Survey Station S-4				10. Date 6/26/74			

11. Transect Number	Water Surface												Stream Bottom												Stream Bank												44. Velocity
	12. Total Width of Channel	13. Water Width	14. Riffle Width	Depths				Pools				23. Aquatic Plants	24. Bedrock	25. Boulders 12"-18"	26. Large Boulders 18"-24"	27. Small Boulders 3"-6"	28. Coarse Gravel 1-3"	29. Fine Gravel 0.1-1"	30. Sand	31. Silt	32. Clay	33. Rock	34. Organic Debris	Left Bank				Right Bank				43. Stream Gradient					
				15. 1	16. 2	17. 3	18. Avg.	19. Width	20. Class	21. Location	22. Feature													35. Cover	36. Stability	37. Class	38. Landform Gradient	39. Cover	40. Stability	41. Class	42. Landform Gradient						
T1A	46	4	4	1	2	0.5	0.9					2R					2	2							1	3	grass soil	12	X	X	X	4	4%	1			
T1B	-	2	-	2	3	1	1.5	2	4	all dpx	-								2						X	X	X	X	2	3	grass soil	X	3	.8			
T2	5	3	3	3	1	2	1.5	-	-	-	-						3								2	4	grass rock soil	7	1	4	grass rock soil	11	3	.9			
T3	8	7	4	3	4	6	3.2	3	4	Ruck	1R	2		3					2						2	2	rock	12	1	4	rock	11	3	.9			
T4	8	4	4	2	2	1	1	-	-	-	1R						4								1	3	grass rock soil	13	1	3	grass rock soil	13	4	.9			
T5	9	8	3	1	2	2	1	1	5	C	-					6	2								3	3	grass rock	13	2	3	grass rock	13	5				
	76	28	18				.15	6				4	2		9	11	2	4							19	15		11.4	7	17	10.4	4.4	.9				

45. Access Low std road 46. Water Temperature 77 47. Air Temperature 85 48. Time 2:30 p.m.

49. Elevation 7160' 50. Turbidity clear 51. Water Analysis: Hach Kit X Chemical (State) Coli (State)

52. Water Quality Class (State) cc 53. DWR (State) Fishing Water Class 6 54. DWR (State) Stream Catalog No. VI.B.5.a.(1) 55. MU Zone people

56. Land Type 9 57. Vegetative Type 9-4 Section No. 10-20

58. Discharge (c.f.s.) 1 cfs est. 59. % Stream Shaded 10-20

59. General Remarks

Reference stake near juniper on west side of road crossing the creek - orange paint on juniper tree (at throw down deer hunters and camp area).

T-1 Located 100' upstream from reference stake - T1A and T1B are at road crossing. Stake on right side of stream.

T-2 Located 100' upstream from T1A & T1B - stake on right side of stream. Rock marked with orange paint.

T-3 Location 100' upstream from T-2. Rock painted orange - stake on right bank.

T-4 Located 100' upstream from T-3. Rock painted orange - stake on right bank. Photo point.

T-5 Located 100' upstream from T-4. Stake on right side of stream. Orange paint on rocks - large juniper tree on left side of stream.

DWR electrofishing station located about $\frac{1}{4}$ mile downstream on road crossing to burn area from telephone lines.

No fish observed in this section. Cattle use of area moderate to heavy on bank cover and grasses. Silt present in streambed in excess of natural.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah				3. District Fillmore				5. Drainage Beaver River				7. Location: T. R. Sect. T30S, R6W, Sec 10				9. Investigators Gervais, Larsen, Duff			
2. County Beaver				4. Resource Area-P.E. Beaver				6. Stream Birch Creek				8. Survey Station S-5				10. Date 6/27/75			

Transect Number	Water Surface												Stream Bottom												Stream Bank												Stream Gradient	Velocity
	Total Width of Channel	Water Width	Riffle Width	Depths				Pools				Aquatic Plants	Bedrock	Boulders +12"	Large Rubble 6-12" 3-6"	Small Rubble 3-6"	Coarse Gravel 1-3"	Fine Gravel 0.1-1"	Sand	Silt	Clay	Muck	Organic Debris	Left Bank				Right Bank										
				1	2	3	Avg.	Width	Class	Location	Feature													Cover	Stability	Class	Landform Gradient	Cover	Stability	Class	Landform Gradient							
																																15	16	17	18	19		
T1a	16	6		4.4	3.2	2.7	6	2	all	depth								3	2				1	4	3	rock soil	11	X	X	X	12	2	15					
T1b		1	1	5.1	1.2	0.5																1	X	X	X	-	4	3	rock soil									
T2	10	4		5.2	1.8	0.5	4	2	all	depth						2			2				4	2	rock soil	9	4	2	"	16	2							
T3	8	8		4.5	1.1	0.5	8	2	all	"									5	3		8	4	2	"	10	4	2	"	18	3							
T4	14	7		6.7	1.0	0.5	7	1	all	"									5	3			4	2	"	15	4	2	"	15	2							
T5	19	10		3.8	0.5	0.2	1	4	cl	log							4	5					2	2	"	10	3	2	"	15								
	67	36	1				53	29	15								2	7	14	11	2	18	11			11	19	11		15	2.2	15						

45. Access Low std road 46. Water Temperature 48°F 47. Air Temperature 65°F 48. Time 0935

49. Elevation 7400' 50. Turbidity clear-milky 51. Water Analysis: Mech Kit _____ Chemical (State) _____ Coll (State) _____

52. Water Quality Class (State) cc 53. DWR (State) Fishing Water Class 3 54. DWR (State) Stream Catalog No. VI.B.5.a.(2) 55. MU Zone people

56. Land Type 9 57. Vegetative Type 10 Section No. _____ 58. Discharge (c.f.s.) 1 59. % Stream Shaded 90

59. General Remarks

Located 0.6 miles above FS-BLM fence downstream.

- S-5 Located at mid-oint of beaver ponds. 143 ft. N from S-1 stake to juniper tree south of road. Stake on left bank; blue flagging on 9" aspen snag. Station located on beaver pond with island den.
- T-1 Located 100' u/s; stake on left bank; below beaver dam; rock & 6" aspen painted orange. 20" juniper painted on rt. bank.
- T-2 6' banks from streambed to top bank. Stake 100' u/s on left bank; 12" aspen below stake is flagged & painted.
- T-3 100' u/s; stake on left bank above a beaver dam; blue flagging on river birch tree; Focked aspen on right bank with orange T-3 marked on it; bank depth 2' high from water.
- T-4 100' u/s stake on left bank; 8 foot bank; 18" aspen on rt. bank spray painted. 15" aspen on left bank with blue flagging narrow incised channel upstream from stake.
- T-5 100' u/s; stakes on left bank at downed snag on ground which is painted orange. Blue flagging on 8" aspen snag above transect. Juniper & aspen together directly across from stake; channel filled with debris, banks 8' high; old beaver activity.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah				3. District Beaver				5. Drainage Beaver River				7. Location: T. R. Sect. T30N R6W Sec 10				9. Investigators Duff/Gervais/Larsen			
2. County Beaver				4. Resource Area-P.U. Tushar (USFS)				6. Stream Birch Creek				8. Survey Station S-6				10. Date 6-27-74			

Transect Number	Water Surface													Stream Bottom													Stream Bank										Stream Gradient	Velocity
	Total Width of Channel	Water Width	Riffle Width	Depths				Pools			Aquatic Plants	Bedrock	Boulders	Large Rubble 6-12"	Small Rubble 3-5"	Coarse Gravel 1-3"	Fine Gravel 0.1-1"	Sand	Silt	Clay	Muck	Organic Debris	Left Bank			Right Bank												
				1	2	3	Avg.	Width	Class	Location													Feature	Cover	Stability	Class	Landform Gradient	Cover	Stability	Class	Landform Gradient							
																																15	16	17	18	19		
T1	6	4	3	3	3	1	17	1	5	L	rock	1R				3	1							1	3	grass	13	1	3	grass	12	3	.5					
T2	4	3	2	2	3	2	17	1	5	R	rock					3							1	3	grass	14	1	2	grass	12	3	.6						
T3	7	3		4	4	1	12	3	3	all	rock				1	2							1	3	grass	15	1	3	"	15								
T4	8	5		2	6	2	25	5	3	all	rock					1	3	1					3	2	"	17	1	2	"	12	3							
T5	9	5	3	3	2	2	17	1	5	R	-				2	1		2					3	2	"		1	2	"		4	.8						
							19	1	5	L	-																											
	34	20	8				19	12				1R			3	10	4	3					9	13		14.75	5	12			3.2	.6						

45. Access low std road 46. Water Temperature 57°F 47. Air Temperature 80°F 48. Time 1130

49. Elevation 7640' 50. Turbidity clear 51. Water Analysis: Hach Kit _____ Chemical (State) _____ Coli (State) _____

52. Water Quality Class (State) cc 53. DNR (State) Fishing Water Class 3 54. DNR (State) Stream Catalog No. _____ 55. MU Zone people

56. Land Type 9 57. Vegetative Type 4-10 Section No. VI.B.5a (2) 58. Discharge (c.f.s.) est 1 cfs 59. % Stream Shaded 0

59. General Remarks

Station 6 located at throw-down campsite 0.1 mile above cattle guard-crossing on road; 0.4 mile above S-S by road.

S-6 ref to 18" spruce tree on right bank and 36" cottonwood tree on left bank some 20' back from bank. Site of start of DWR electrofishing station and BSW collection site (1973).

T-1 located 100' upstream; stake on left bank.

T-2 located 100' upstream; stake on left bank.

T-3 located 100' upstream; stake on left bank.

T-4 located 100' upstream; stake on left bank; under large branching river birch tree.

T-5 100" upstream from T-4; stake on left bank ; next to 12" aspen tree about 6' from bank.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah		3. District Beaver		5. Drainage Beaver River		7. Location: T. R. Sect. T30N R6W Sec 12		9. Investigators Gervais/Larsen/Duff	
2. County Beaver		4. Resource Area-P.U. Tushar (USFS)		6. Stream Birch Creek (SoFk)		8. Survey Station S-7		10. Date 6-27-74	

Transect Number	Water Surface												Stream Bottom												Stream Bank												Stream Gradient	Velocity
	Total Width of Channel	Water Width	Riffle Width	Depths				Pools				Aquatic Plants	Bedrock	Boulders >12"	Large Rubble 6-12"	Small Rubble 3-6"	Coarse Gravel 1-3"	Fine Gravel 0.1-1"	Sand	Silt	Clay	Muck	Organic Debris	Left Bank				Right Bank										
				1	2	3	Avg.	Width	Class	Location	Feature													Cover	Stability	Class	Landform	Gradient	Cover	Stability	Class	Landform	Gradient					
																																		15	16	17		
T-1	6	2	1	1.2	2.1	1	1	4	L	Rock					2											1	2	Grass Soil	20	1	3	Grass Soil	10	6	.5			
T-2	10	2		3.3	4.2	5	2	3	11	Rock					2											1	3	Grass Soil	22	1	3	Grass Soil	11	6	.2			
T-3	7	5		3.5	2.2	5	5	2	11	Rock							2		3							4	3	Rock Soil	20	4	3	Rock Soil	10	6				
T-4	12	3	2	2.2	3.1	1	1	4	L	Rock	IR			2											1	4	4	Rock Soil	24	4	4	Rock Soil	9	9				
T-5	3	3		2.2	1.1	1	3	4	11	Rock															3	4	4	Rock Soil	24	4	4	Rock Soil	5	9	.3			
	38	15	3			16	12				1			4	2	2	3								4	14	16		22	14	17		9	7.2	.3			

45. Access low std. trail 46. Water Temperature 54°F 47. Air Temperature 82°F 48. Time 1315

49. Elevation 8200' 50. Turbidity clear 51. Water Analysis: Hatch Kit X Chemical (State) Coli (State) _____

52. Water Quality Class (State) CC 53. DWR (State) Fishing Water Class 3 54. DWR (State) Stream Catalog No. _____ 55. MU Zone people-rec.

56. Land Type 9 57. Vegetative Type 4-6 Section No. V1.B.5.a.(2) 58. Discharge (c.f.s.) .5 est. 59. % Stream Shaded 0-30

59. General Remarks

S-7 located at junction of No Fk with So Fk. Ref. to 15" spruce tree on left bank.

T-1 100' upstream; stakes on right and left banks on trail crossing, 4" fish in small class 4 pool on transect line.

T-2 100' upstream; stakes on both banks in meadow area.

T-3 100' upstream; stakes on both banks, 5" fish obs in pool at transect; in forested area.

T-4 100' upstream; stakes on left bank and right bank.

T-5 100' upstream; stakes on both banks; transect between two 18" down spruce snags on ground.

STREAM HABITAT SURVEY FIELD FORM

USO 6670-1 (7/73)

1. State Utah				3. District Beaver				5. Drainage Beaver River				7. Location: T. R. Sect. T30N. R6W Sec 12				9. Investigators Gervais/Larsen/Duff			
2. County Beaver				4. Resource Area-P.U. Tushar (USFS)				6. Stream Birch Creek (NoFk)				8. Survey Station S-8				10. Date 6-27-74			

11. Transsect Number	Water Surface										Stream Bottom										Stream Bank										44. Velocity				
	12. Total Width of Channel	13. Water Width	14. Riffle Width	15. Depths				19. Pools				23. Aquatic Plants	24. Bedrock	25. Boulders >12"	26. Large Rubble 6-12"	27. Small Rubble 3-6"	28. Coarse Gravel 1-3"	29. Fine Gravel 0.1-1"	30. Sand	31. Silt	32. Clay	33. Rock	34. Organic Debris	35. Left Bank					38. Right Bank						
				1	2	3	Avg.	17. Width	18. Class	20. Location	21. Feature													Cover	Stability	Class	Landform Gradient	Cover	Stability	Class		Landform Gradient			
																																	42. Stream Gradient		
T-1	11	4	4	1	1	1	0.8										4								4	2	Soil Roots	6	4	2	Soil Roots	18	8		
T-2	4	4	3	2	3	2	1.7	1	4	R				1				3								4	2	Grass	5	4	2	Grass	18	5	1.1
T-3	7	3	1	4	3	2	2	2	4	R							2	1								4	2	Rock	11	4	3	Grass	24	5	1.8
T-4	9	3	3	3	2	4	2	-	-	-							2								1	4	2	Soil Roots	12	4	2	Rock	22	5	
T-5	8	4	4	3	2	1	1.5	-	-	-							3	1								4	4	Grass	12	4	4	Rock	18	6	
	39	18	15				1.6	3									1	3	5	5	3					1	20	12		9.2	20	13		5.8	1.4

45. Access low std trail 46. Water Temperature 54°F (59° at T4) 47. Air Temperature 82°F 48. Time 1315
49. Elevation 8200' ? 50. Turbidity clear 51. Water Analysis: Hach Kit X Chemical (State) Coli (State)
52. Water Quality Class (State) cc 53. DWR (State) Fishing Water Class 3 54. DWR (State) Stream Catalog No. VI.B.5.a.(2) 55. MU Zone hiking-people rec.
56. Land Type 9 57. Vegetative Type 6 58. Discharge (c.f.s.) est 1 cfs 59. % Stream Shaded 80-90

59. General Remarks

S-8 Located at junction of north fork with south fork. Ref to 15" spruce tree on left bank.

T-1 100 feet-stakes on both banks. Banks steep and eroded.

T-2 100 feet upstream from T1, large spruce tree on both banks, stakes on both banks.

T-3 location 100 feet upstream from T2, stake on left bank - livestock crossing 4 feet upstream from transect line.

T-4 location 100 feet upstream from T-3. Stake on left bank - Dead 14" pine tree across stream 2 feet upstream from transect

T-5 Location 100 feet upstream from T-4. Stake on both banks.

Large spruce tree 6 feet from stake. DBH of tree 4 feet. Photo point at T-5. Stream banks shallow.

TABLE IV. PHYSICAL CHARACTERISTICS SUMMARY FOR BLM & USFS LAND ON BIRCH CREEK 1/

Sta.	%Optimum Habitat							% Water Surface in Channel Area	% Spawning 2/ Gravels	3/ Silt Sediments	Avg. Depth (Ft)	Avg. Width (Ft)	Channel Width (Ft)	Velocity (fps)	Stream flow (c.f.s.)	%Stream Stream Gradient	Temp. (° F) Air Water		Land-form gradient %		Stream Shade %	
	Pool-Riffle Ratio	Pool Structure	Pool Quality	Stream Bottom	Bank Cover	Bank Stability	Total Habitat												LB	RB		
BLM																						
1	74	23	37	94.7	42.5	90	60	43	21	37	.2	3.8	44	0.72	0.33	4.7	79	57	50	44	50	
2	90	40	72	100	75	87.5	77	69	17	33	.27	3.6	26	2.6	0.5	.3	80	65	7	17	30	
3	52	10	37	88.8	30	70	48	69	48	19	.2	5.4	39	1.8	1	3.7	88	82	14	18	0	
4	42	0	0	92.8	40	80	42	37	46	14	.15	4.7	76	0.9	1	4.4	85	68	11	10	20	
AVG 4/	65	18	37	94	47	82	57	54.5	33	25	.21	4.4	46	1.5	0.7	3.3	83	68	21	22	25	
USFS																						
5	38	26	33	100	92.5	55	57	54	25	69	.53	6.0	67	0.5	1	2.2	65	48	11	15	90	
6	80	32	53	100	35	62.5	60	59	70	15	.19	4.0	34	0.6	1	3.2	80	57	15	13	0	
7	40	19	23	100	70	82.5	56	39	27	20	.16	3.0	38	0.3	0.5	7.2	82	54	22	9	30	
8	34	0	0	83.3	100	62.5	47	46	56	17	.16	3.6	39	1.4	1	5.8	82	54	9	20	90	
AVG 4/	48	19	27	96	74	66	55	49.5	45	30	.26	4.2	45	0.7	0.88	4.6	77	53	14	14	53	

1/ These are averages from individual station characteristics.

2/ Includes only fine and coarse gravels (0.1 to 3.0 inches).

3/ Includes sand, muck, and silts averages for each individual station.

4/ In some cases these individual averages may show minor variance between total averages for each stream reach summaries in Tables 1, 2, 3.

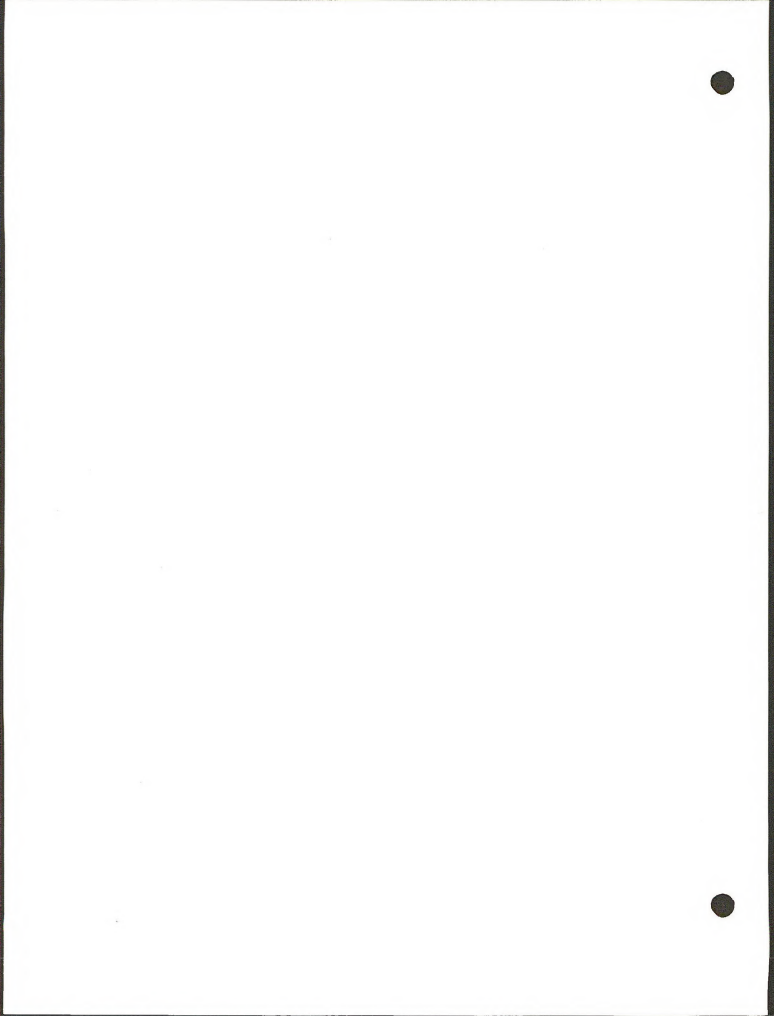
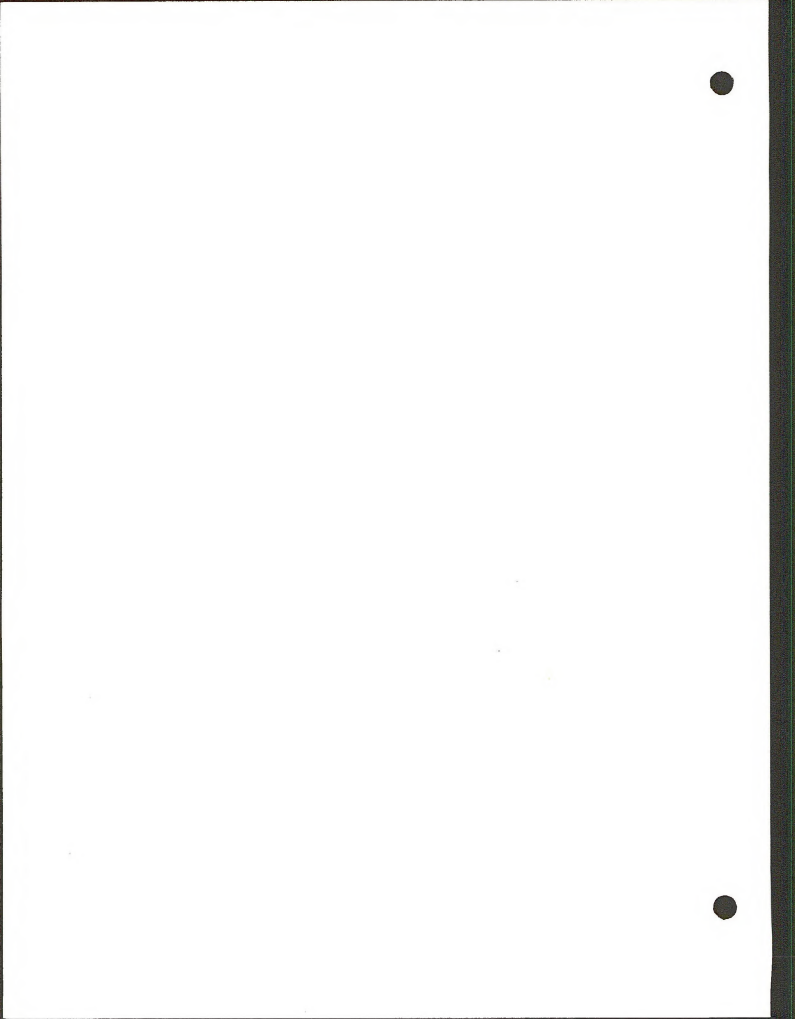


TABLE V

Birch Creek, Illinois District
1974 Water Temperatures (°C) 1/
Ryan Hydrothermograph # 7934

<u>Date</u>	<u>Max.</u>	<u>Min.</u>	<u>Date</u>	<u>Max.</u>	<u>Min.</u>
June 26	(Installed 1545 hrs. air 82°F, Water 71°F; est. 1 c.f.s.)		Aug. 12	15.8	11.7
			13	17.4	11.5
27	19.2	11.7	14	19.0	11.3
28	19.8	12.4	15	18.8	11.0
29	20.0	12.6	16	19.0	10.6
30	17.0	13.0	17	20.0	11.3
July 1	18.9	11.5	18	20.0	11.7
2	18.3	11.6	19	20.0	12.0
3	19.0	12.0	20	18.0	12.3
4	17.8	12.9	21	17.6	9.3
5	18.1	12.4	22	17.9	9.3
6	18.0	13.9	23	18.6	10.0
7	18.3	11.7	24	16.5	10.7
8	18.8	13.0	25	16.6	11.4
9	19.9	12.6	26	17.3	11.0
10	18.6	12.3	27	17.5	11.3
11	19.0	11.0	28	17.5	11.5
12	19.7	11.6	29	18.0	11.2
13	19.0	12.5	30	19.1	11.5
14	18.0	14.5	31	19.4	11.0
15	16.9	15.0	Sept. 1	18.5	11.0
16	17.0	15.2	2	18.4	10.4
17	17.2	14.0	3	18.3	10.5
18	17.0	13.0	4	18.4	11.5
19	15.2	14.1	5	18.3	10.8
20	17.7	13.9	6	19.0	12.3
21	16.4	13.8	7	17.5	13.5
22	13.0	13.0	8	19.3	12.0
23	16.7	12.7	9	18.5	13.2
24	20.0	13.7	10	18.8	12.5
25	19.2	14.1	11	17.5	12.5
26	17.3	14.5	12	17.0	10.7
27	20.0	14.0	13	16.0	11.0
28	20.8	14.6	14	13.0	8.0
29	22.0	14.9	15	11.9	6.3
30	20.1	14.5	16	13.5	6.2
31	20.0	15.0	17	14.0	7.1
Aug. 1			18	12.9	7.2
2	18.8	14.3	19	15.1	8.0
3	18.8	13.5	20	15.1	8.1
4	19.5	13.2	21	15.0	8.1
5	19.4	14.0	22	15.5	9.0
6	19.0	13.3	23	13.9	9.0
7	15.8	13.0	24	13.9	9.0
8	16.7	12.3	25	14.0	9.0
9	17.0	12.0	26	13.9	8.1
10	17.2	12.0	27	9.2	6.1
11	18.8	10.5	28	10.0	1.8
			29	11.3	4.1



<u>Date</u>	<u>Max.</u>	<u>Min.</u>	<u>Date</u>	<u>Max.</u>	<u>Min.</u>
Sept. 30	12.0	5.7			
Oct. 1	12.8	6.1			
2	13.1	7.2			
3	10.5	9.1			
4	10.8	7.9			
5	10.0	7.1			
6	10.1	5.0			
7	10.0	6.0			
8	12.0	7.9			
9	11.0	8.5			
10	11.0	8.1			
11	9.9	6.1			
12	7.7	4.2			
13	8.5	3.0			
14	8.1	3.0			
15	8.8	3.0			
16	8.1	3.0			
17	9.8	4.0			
18	10.2	5.0			
19	10.5	6.0			

1/ Ryan Hydrothermograph # 7934 recorded on
Chart # 11110, 11112, 13597.

Hydrothermograph located in the stream approximately 100 feet
west(downstream) of the USFS boundary on NRL(T. 30 S., R. 6 W.,
Sect. 9.).

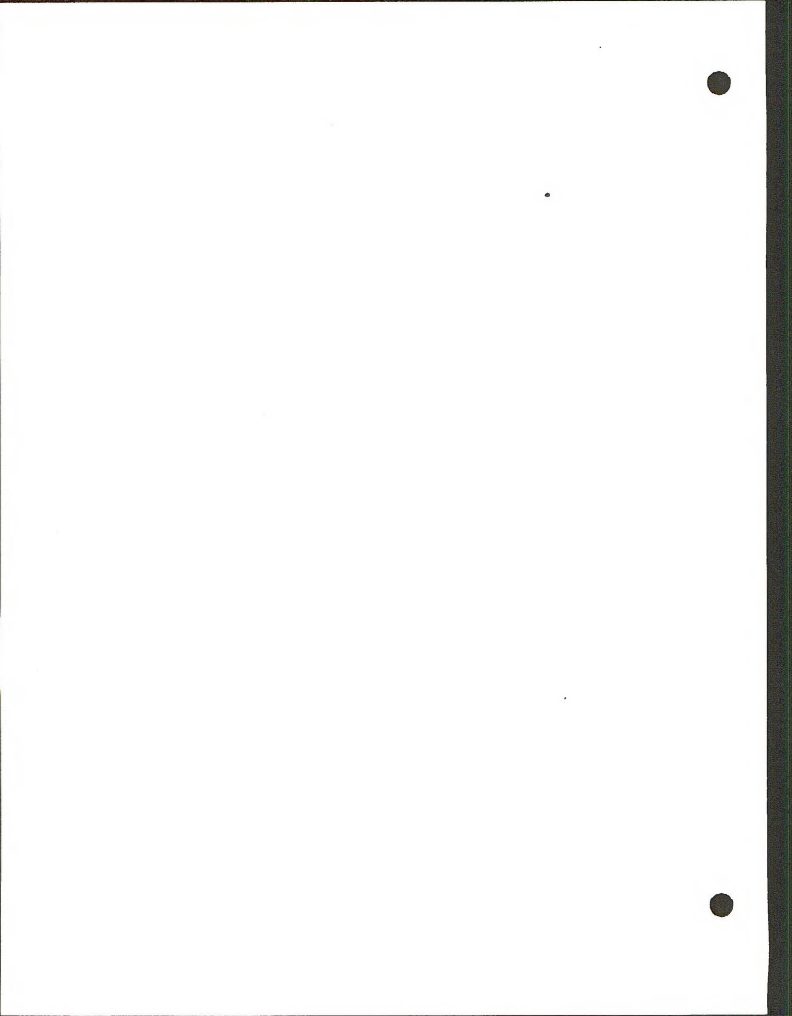


Table VI

WATER QUALITY MONITORING
(Field Analysis)

CHEMICAL-PHYSICAL

FILLMORE DISTRICT

STORET NUMBER

Stream/Lake BIRCH CREEKWatershed Planning Unit BEAVER

Unit No. _____

Location at BLM-FS BoundaryT. 30S R. 6W Sec. 9Y Y M M D D
7 4 0 6 2 7

Collection Date

Collection Time (Military)

1 6 0 0

Air Temp., °F

8 2 -

Water Temp., °F

6 5 -

*1. Alkalinity (PPTH)

0 -

(M.O.)

6 5 -

*2. Carbon Dioxide

2 -

*3. Chloride

5 - 0 -

*4. Copper #

0 -

*5. Hardness, Calcium

3 5 -

Total

5 0 -

*6. Iron #

3 5 0 -

*7. Manganese #

0 -

*8. Oxygen, Dissolved

9 - 0 -

*9. pH

6 - 8 -

*10. Sulfate

2 -

*11. Total Dissolved Solids

4 -

*12. Turbidity (Units)

1 -

*13. Flow (C.F.S.)

1 -

Analysis Date

6-28-74 Duff

Sample Number

Temp. Range (Min.) 48°F (Max.) 72°FDates of Temp. Range 6/27 To 6/28

14. Chlorine

-

15. Chromate

-

16. Detergents

-

17. Flouride

-

18. Hydrogen Sulfide

-

19. Nitrate

-

20. Phosphate, Ortho

-

Poly

-

21. _____

22. _____

23. _____

24. _____

25. _____

26. _____

27. Weather

clear

(Parts Per Million Unless
Indicated Otherwise)

WORK SHEET

Use Microgram/Liter

450 7151-2



2845

Table VII

NOTE:
Please use pencil
on ball pen.

UTAH DEPT. OF HEALTH AND WELFARE DIVISION OF HEALTH 44 MEDICAL DRIVE, SALT LAKE CITY, UTAH 84113

Lab
No.

WATER SAMPLE FOR BACTERIOLOGIC EXAMINATION

Sample Collected
From (Check one)

City or Town Distribution System ☐
Swimming Pool ☐ Stream ☐

Other ☐ (Describe)

Exact Description of Sampling Point:

Trail Creek Sec 9

Unchlorinated ☐

Chlorinated ☐

Residual

p.p.m.

Name of Town, Swimming Pool, Stream, etc.:

Trail Creek

Location

Alpine-Hickory Bend County Bear

Sample Collected By DAF

Date of Collection 6-27-74 Time 1600

Send Report to U. S. Bureau of Land Management

Address Division of Resources (7151)

P. O. Box 11205

Remarks Salt Lake City, Utah 84111

INTERPRETATION OF ANALYSIS: SATISFACTORY ☐ UNSATISFACTORY ☐

Remarks:

By COO
Environmental Health

Date Rec'd

6/28/74

Date Rep'd

EXAMINE FOR

☐ Coliforms in 10 ml. portions

☐ Fecal Coliforms in 10 ml. portions

☒ M P N Coliforms per 100 ml.

☒ M P N Fecal Coliforms per 100 ml.

☐ Membrane Filter (M. F.)

☐ Plate Count — 24 hrs. @ 35° C.

RESULTS OF ANALYSIS

Volume ml.	Presumptive			Confirmed (BGL B B)							Fecal at 44.5° C				
	24	48		24	48	24	48	T	24	48	24	48	T		
☐ 10.0	5	5						5							
☒ 1.0	3	3						3							3
☒ 1.0	3	3						3							3
☒ 10-1	3	3						3							3
☒ 10-2	3	3						3							3
☒ 10-3	3	3						3							3
☐ 10-4	3	3						3							3
☐ 10-5	3	3						3							3
☐ 10-6	3	3						3							3

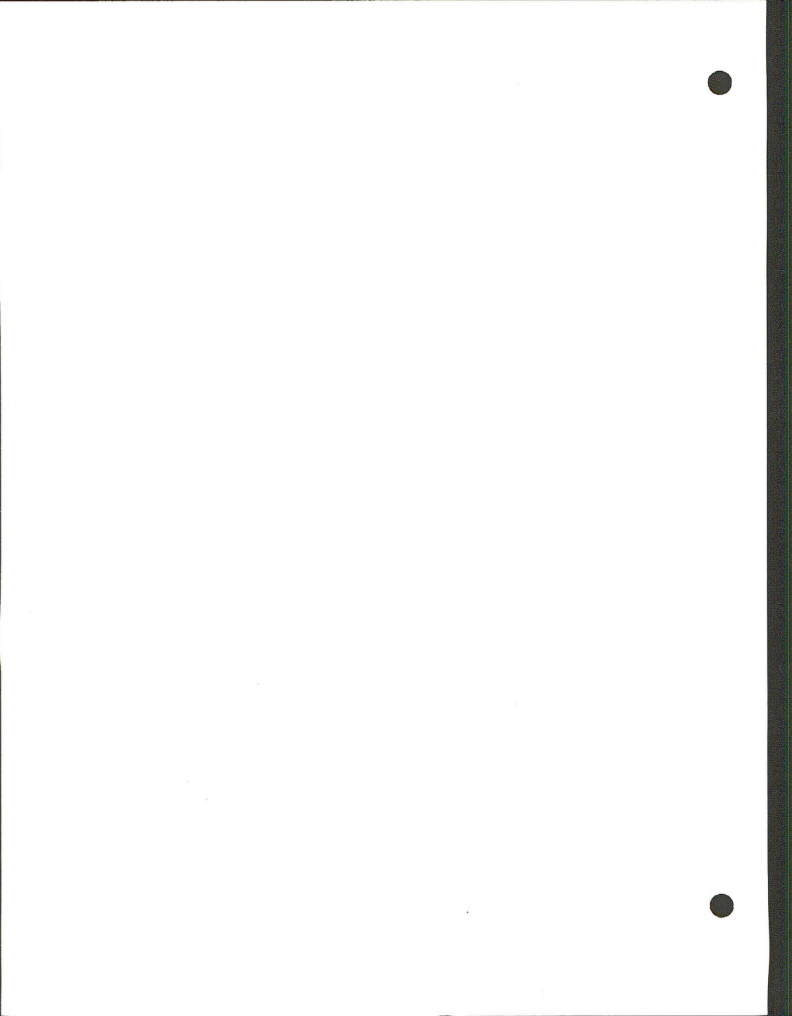
M P N Coliforms 27.00/100 ml. Plate Count / ml.

M P N Fecal Coliforms 430/100 ml.

M. F.: Ml. Sample Colonies Coliforms /100 ml.

Analysis Approved by Laboratory

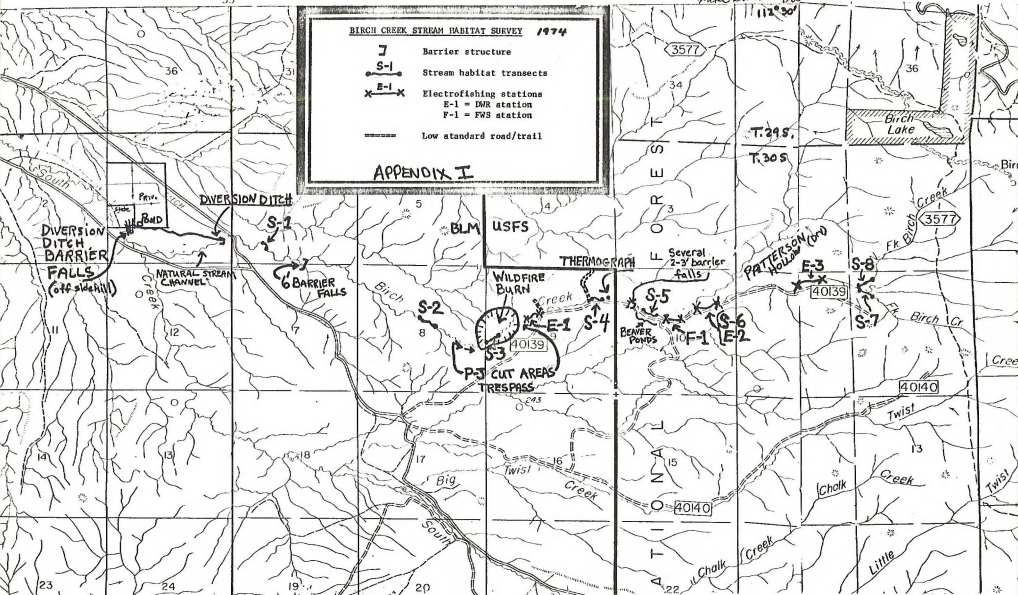
NOTE: See back of final copy for collection instructions
Write Heavily — No Carbon Required

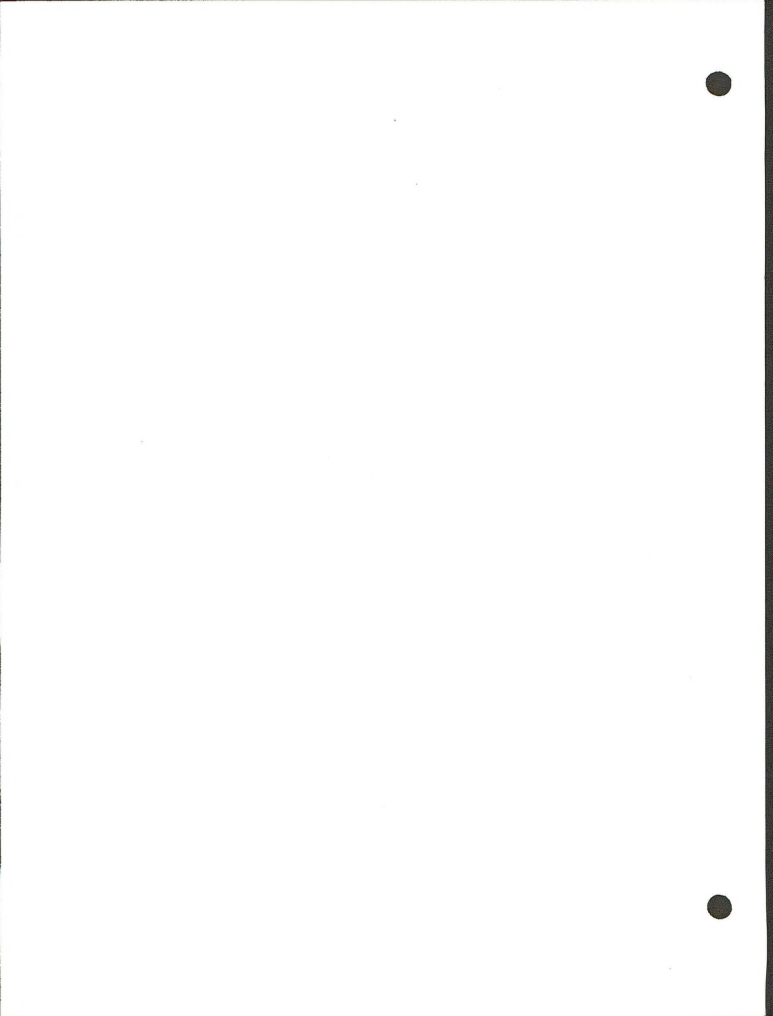


FISHLAKE NATIONAL FOREST

R. 7 W. R. 6 W.

R. 6 W R. 5 W





UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
COLORADO COOPERATIVE FISHERY UNIT
COLORADO STATE UNIVERSITY
FORT COLLINS, COLORADO 80521

APPENDIX II

March 26, 1974

Dr. Clare Stalnaker
Utah Cooperative Fishery Unit
Utah State University
Logan, Utah 84321

Dear Clare:

Enclosed is a data sheet with the values of some of the diagnostic characters we found for the three collections made last summer. Also is a sketch which depicts the grouping of these specimens when 16 characters were compared in about 1200 specimens of cutthroat trout from a wide geographical area. This particular technique is a principal component analysis interpreted from a computer print-out. Only three of the Bonneville specimens overlapped into other groups (two with the Mt. Wheeler cluster). The lack of basibranchial teeth in 4 of 16 Asay Creek trout is the most suspicious suggestion of hybridization in any of our three collections, but the Asay Creek specimens look good in all other characters.

Utah is in a fortuitous position to capitalize of the endangered species law because there are at least three subspecies of cutthroat trout which can be considered as endangered or threatened and federal funds for their restoration can be worked right into a management program emphasizing wild trout fisheries for native trout.

Keep me informed of the results of the enzyme analysis.

Sincerely,

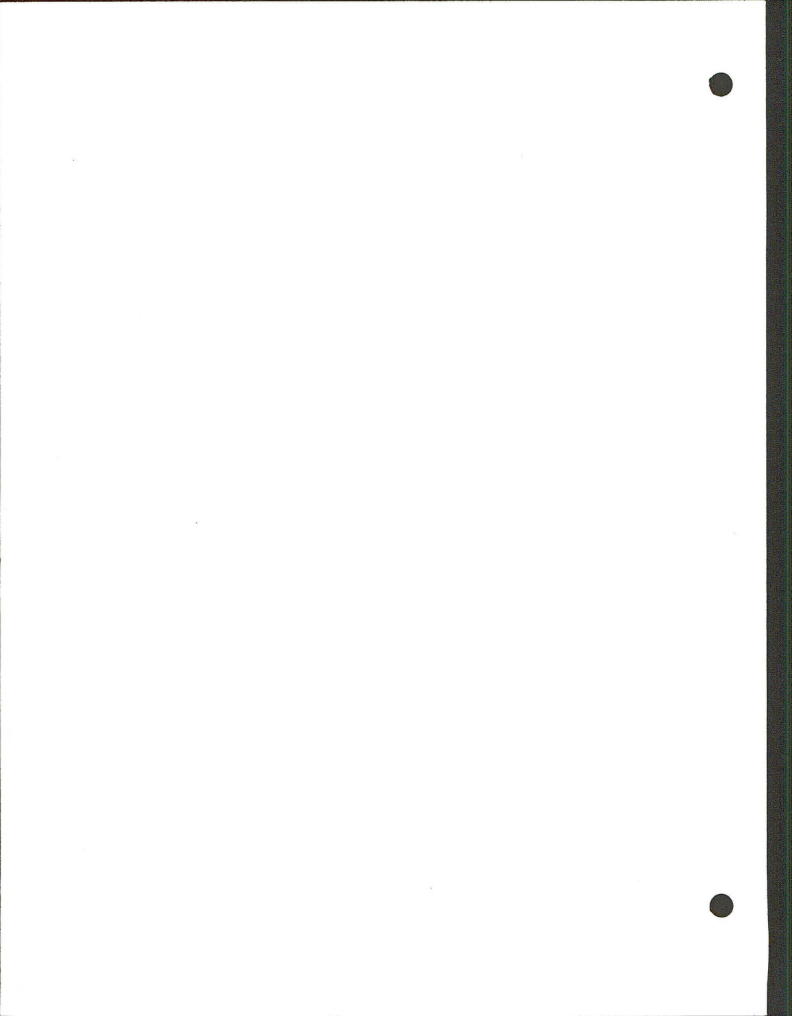


Robert Behnke

RB:vv

Enclosures

cc: Jim Mullen



[illegible]

Areas where I found

samples of the following
plants: yellow stone
cottonwood

yellow stone
cottonwood

upper Snake
River
cottonwood

Nevada
at Wheeler
cottonwood

East three
cottonwood
creek
cottonwood

west three
cottonwood
creek
Mont-Isa

West
Bonneville
Lake
cottonwood
creek
cottonwood

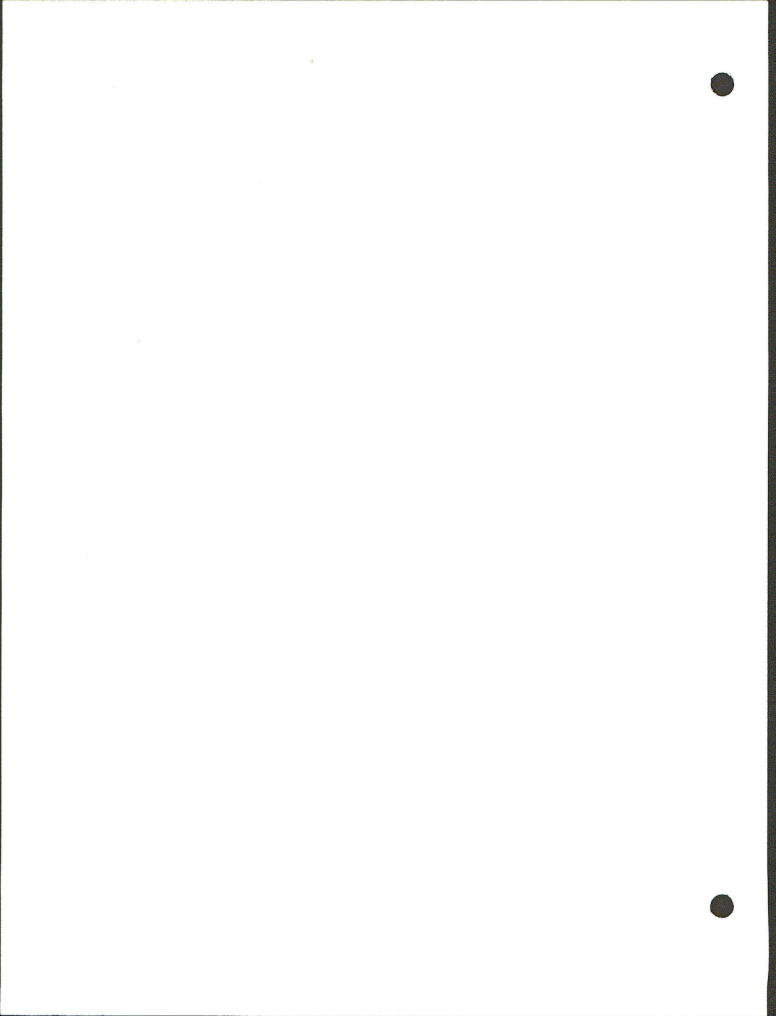


TABLE VIII

Summary of Electrofishing Surveys by the
Division of Wildlife Resources

BLM STATION E-I - 1/10 mile below U.S.F.S. boundary. 480 foot section.

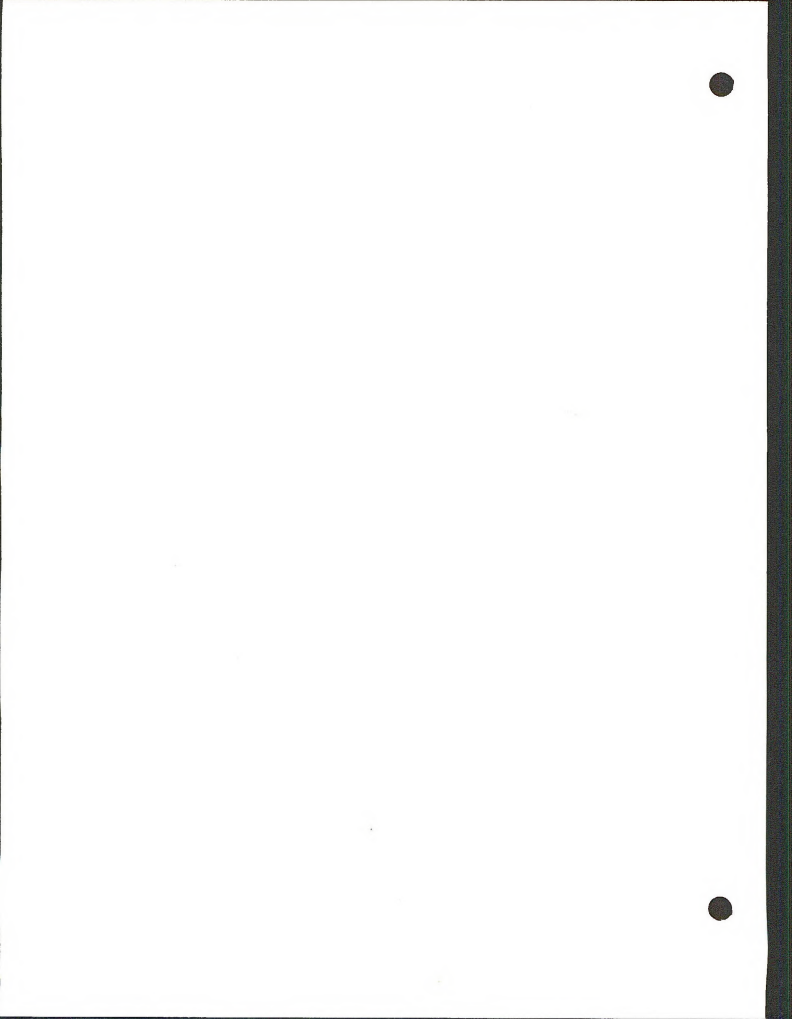
<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	1	210	80
"	1	202	75
"	1	194	65
"	1	225	110
"	1	164	35
Trout per mile	55		
Trout per acre	90		
Lbs. trout per acre	14.4		

USFS STATION E-II- 1/2 mile upstream of F.S. boundary. 500 foot section.

<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	4	0-88	27
"	32	89-164	336
"	5	165-243	447
Trout per mile	410		
Trout per acre	492		
Lbs. trout per acre	21.4		

USFS STATION E-III - 500 yards below confluence of North and South Fork of Birch Creek. 500 foot section.

<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	14	0-88	58
"	30	89-164	695
"	14	165-205	862
Trout per mile	580		
Trout per acre	696		
Lbs. trout per acre	43.2		



APPENDIX III

RARE AND ENDANGERED SPECIES REPORT: THE BONNEVILLE CUTTHROAT TROUT, Salmo clarki utah

Robert J. Behnke
Colorado Cooperative Fishery Unit
Colorado State University
Fort Collins, Colorado 80521
December, 1970

Introduction

Detailed information concerning the classification of the cutthroat trout native to the Bonneville basin is virtually non-existent. When requested to render decisions on the relative pureness of certain populations, it became apparent to me that there is no valid information in the literature pertaining to diagnostic characters possessed by S. c. utah useful for authoritative recognition. Can the native trout of the Bonneville basin be readily separated from other subspecies of cutthroat trout by a combination of characters?

Examination of ancient museum specimens and recent specimens from the western part of the basin indicates that two distinct forms of cutthroat trout ^{were definitely (1972)} ~~may be~~ native to the Bonneville drainage in Utah and Nevada. The typical S. c. utah, indigenous to the Bear, Jordan, Provo, and Sevier river drainages is virtually indistinguishable from the widespread S. c. lewisi of the upper Missouri and Columbia river basins. A trout, evidently once native to the Snake Valley segment of the Bonneville basin and now found in a few small streams on Mt. Wheeler and Mt. Moriah appears to be consistently differentiated from S. c. utah by some meristic and morphological characters and in the profuse development of basibranchial teeth.

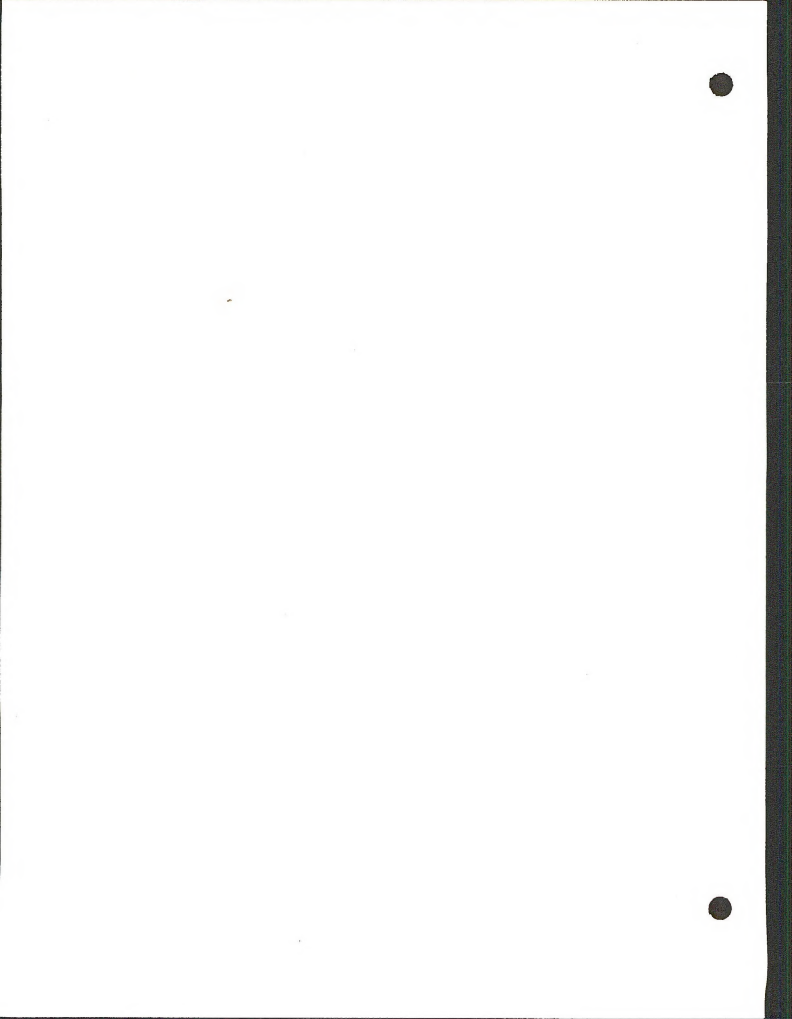


Historical Review

Suckley (1861) wrote: "A variety of the Salmo virginalis occurs in Lake Utah, a large sheet of fresh water about fifty miles south of Salt Lake City. The fish are less spotted than those caught in the mountain streams near by, and attain a much larger size. For this variety or kind we will, for the present, apply the provisional name of Salmo utah." Suckley intended the name utah only for the cutthroat trout of Utah Lake, whose distinctive characters were probably almost wholly a reflection of direct environmental influence caused by the conditions of Utah Lake, and not due to genetic differentiation.

Although Suckley's description of "Salmo utah" is inadequate to separate utah from any other form of cutthroat trout, the published account of S. utah fixes the name utah as the earliest name applied solely to trout of the Bonneville basin. Current practice now includes all cutthroat trout in a single species, Salmo clarki, with subspecies recognition designating major drainage basins or geographical areas. The Bonneville cutthroat trout is usually listed as Salmo clarki utah, but the fact remains that an adequate description establishing the validity of utah allowing its separation from other subspecies has never been published.

There are now almost insurmountable obstacles for conducting a definitive taxonomic study on the native trout of the Bonneville basin. Massive introductions of rainbow trout, S. gairdneri, throughout the basin along with alteration and degradation of habitat has led to the virtual elimination of cutthroat trout from most of their original range. More insidious, however, from the point of view of systematic research, has been the promiscuous mixing of different forms (or subspecies) of cutthroat trout to an extent that when a remote and isolated population

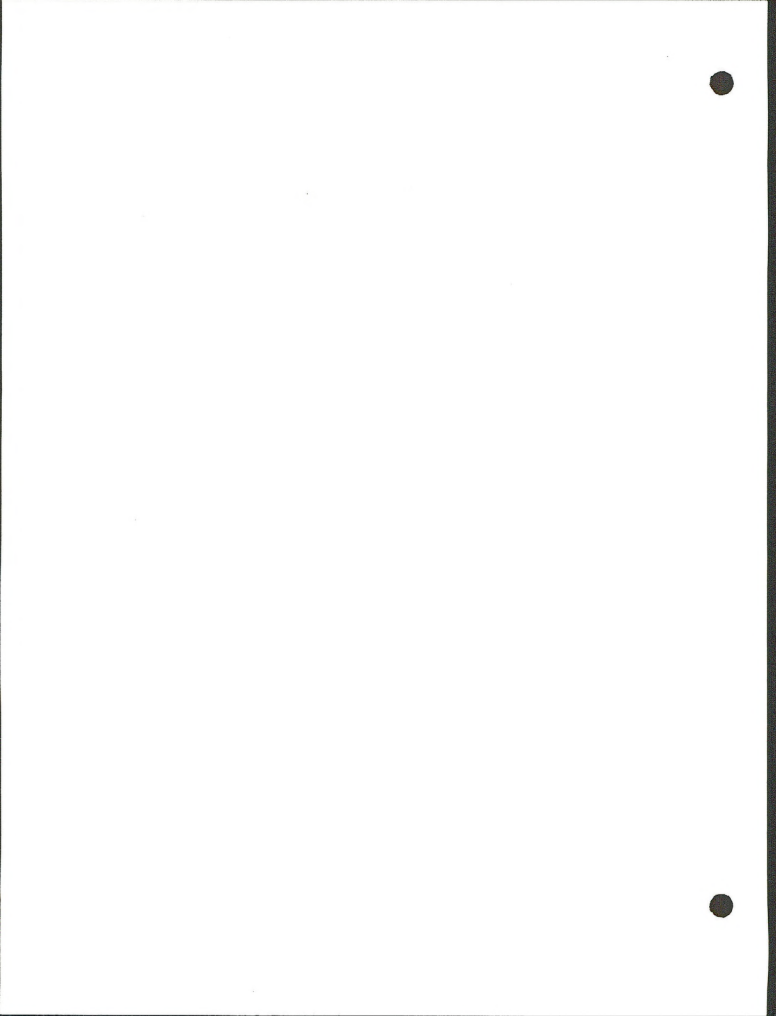


of cutthroat trout is found today - how can it be known if it represents the original Bonneville cutthroat trout or an introduced Colorado River trout (S. c. pleuriticus), Yellowstone Lake trout (S. c. lewisi) or a combination of two or more races of cutthroat trout? Utah Fish and Game Department, as other states and federal agencies propagating cutthroat trout historically have not attempted to maintain the integrity of populations native to specific geographical areas. Eggs are taken from readily available sources. In Utah, cutthroat spawn is mainly from Strawberry Reservoir where the original trout would have been S. c. pleuriticus, but subsequent introductions of Yellowstone Lake cutthroat trout and intensive stocking of rainbow trout certainly has influenced the genotype of the trout now widely stocked in Utah as "native" trout in both the Bonneville basin and the Colorado River drainage.

Miller (1950) stated: "S. clarki utah of the Bonneville basin of Utah and Idaho is believed to be extinct." Cope (1955) also believed the native Bonneville cutthroat trout was extinct. Because of the abundance of small, isolated streams, in remote areas of the Bonneville basin, it seems likely to me that some pure populations of the original Bonneville cutthroat trout should persist. But the question again is raised - how would they be recognized if they are found?

Systematic Status

To answer the question concerning possible uniqueness possessed by the original trout of the Bonneville basin, I examined and recorded data on more than 30 museum specimens collected from 1872 to 1915 from various parts of the Bonneville basin. This data was then compared with data on other subspecies of cutthroat trout to evaluate the degree of differentiation



4

present in the original Bonneville trout and to examine the diagnostic value of particular characters. My conclusions are that there is nothing really unique about S. c. utah - it appears to be quite typical of interior cutthroat trout in general such as the forms grouped under S. c. lewisi and S. c. pleuriticus. There is a trend for lower scale counts in S. c. utah (typically 145-180 vs. 160-200) and higher vertebral counts (61-65 typically 62-63 vs. 61-62 in most other cutthroat trout) but there is broad overlap in these characters.

This lack of obvious differentiation in Bonneville cutthroat trout is somewhat surprising considering the thousands of years of isolation in a large lacustrine environment afforded by the geologic history of the Bonneville basin and Pluvial Lake Bonneville. Other Bonneville fishes exhibit a high degree of endemism. The Lahontan cutthroat trout, S. c. henshawi, theoretically at least, under similar geological and evolutionary histories reveal marked differentiation, possessing 4-6 more gillrakers than is found in other groups of cutthroat trout.

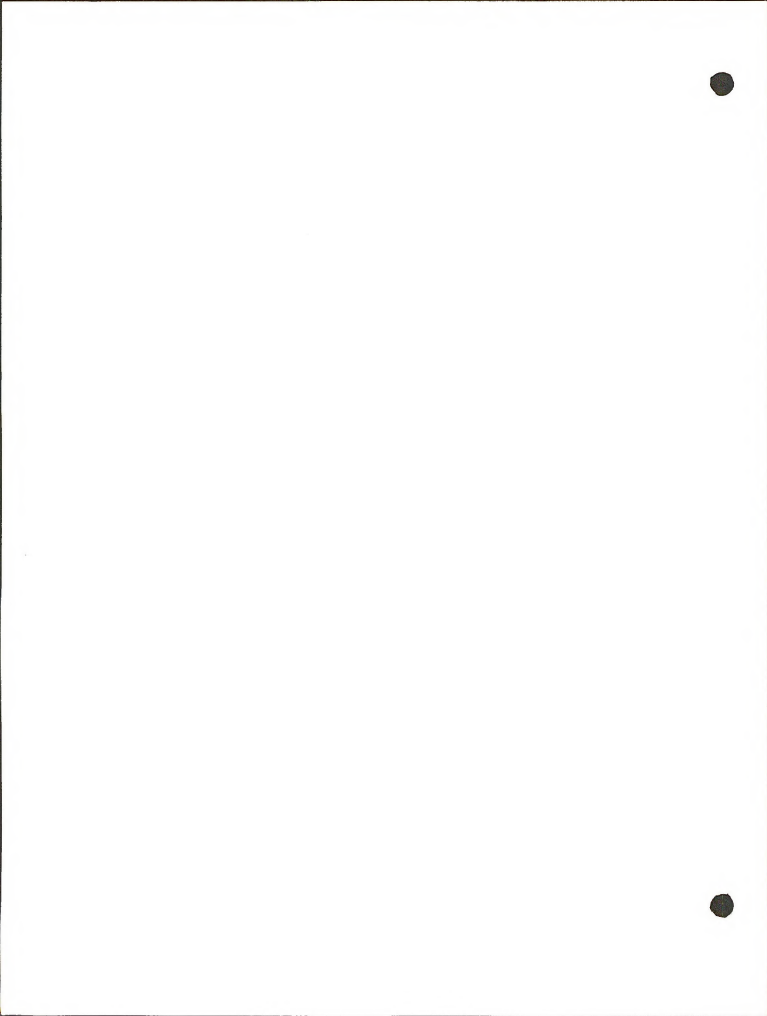
In 1959 I made two collections of cutthroat trout of probably Bonneville origin, outside the basin. A sample was collected from a population of reputed "native" trout from the Virgin River drainage, in the headwaters of Reservoir Canyon near Pine Valley, Utah. I was interested in these trout because the Virgin River drainage was not known to have native trout. If trout were native to the Virgin River, on zoogeographical grounds, they should have been derived from the Gila trout or Apache trout of the Gila River system and not from cutthroat trout. The trout in the headwaters of Reservoir Canyon are typical interior cutthroat trout. They are not derived from Yellowstone Lake cutthroat trout, however, and the scale counts appear typical of S. c. utah. Evidently these trout were



transplanted by the early Mormon settlers of the Pine Valley area from the headwaters of the Sevier River of the Bonneville basin and probably represent one of the few remaining pure populations of the original Bonneville cutthroat trout. Below barrier falls in Reservoir Canyon, the population consists of rainbow x cutthroat hybrids.

The other population first investigated in 1959 is found in Pine Creek, on Mt. Wheeler, White Pine Co., Nevada. Pine Creek drains into Spring Valley. Hubbs and Miller (1948) mentioned that some originally barren streams in desiccating basins west of the Bonneville basin in Nevada were stocked with trout carried over from Trout Creek, Utah (in the Snake Valley section of the Bonneville basin). Expecting to find a population of S. c. utah in Pine Creek, I was surprised and baffled to encounter a cutthroat trout quite unlike any other I had ever seen. The long head and jaw positioned on a deep body with a short caudal peduncle presents an odd "chunky" appearance. The spotting pattern is more uniformly distributed over the body and not so concentrated posteriorly as in S. c. utah. The Pine Creek trout have higher gillraker numbers and a profuse development of basibranchial teeth - up to 50 or more can be detected after alizarin staining, whereas S. c. utah and other cutthroat trout typically have 1-15 such teeth.

There is a strong probability that some of the extreme phenotypic differentiation apparent in the Pine Creek trout is a non-genetic influence induced by living in the very small, limited habitat of Pine Creek as it tumbles off the slopes of Mt. Wheeler. The spotting pattern and particularly the gillraker number and basibranchial teeth development, differentiating these trout from S. c. utah, can be considered as virtually wholly under genetic control. This assumption is supported by comparison of descendants of Pine Creek trout introduced into Hampton



and Goshute creeks (also in White Pine Co., Nev.). There is no doubt that the cutthroat trout in Pine Creek are genetically differentiated from S. c. utah and other cutthroat trout. The level of differentiation would warrant recognition as a new subspecies of Salmo clarki. More important, however, than taxonomic classification, is the evolutionary basis justifying this classification. Does the Pine Creek population represent a geologically recent local divergence in a single isolated stream (the unknown parent stream from which the original stock was introduced) or from the trout in a group of streams connected to Snake Valley which diverged rapidly after the desiccation of Lake Bonneville and the isolation of Snake Valley from the rest of the Bonneville basin? Or, do they represent a more ancient divergence in the cutthroat trout evolutionary lineage which co-existed with S. c. utah in Pluvial Lake Bonneville, but were then restricted to the Snake Valley area after the desiccation? I have found two examples where two forms of cutthroat trout are native to the same basin. In the Lahontan basin, S. c. henshawi is the native trout and even after several thousand years of isolation in the various river systems (Truckee, Carson and Walker) all S. c. henshawi populations remained practically identical. In the Humboldt River drainage of the Lahontan basin, however, another form of cutthroat trout is indigenous, and is consistently differentiated from S. c. henshawi by 2-4 fewer gillrakers and about 20 fewer scales in the lateral series. These two forms must have also been present when Pluvial Lake Lahontan allowed free communication between all the now isolated river systems, and in some unknown manner, genetic segregation was maintained between the two forms. At present, in the upper Snake River in Wyoming, two forms of cutthroat trout maintain genetic segregation. In the very headwater area, above Jackson Lake, and down-



stream from the present Palisades Reservoir site, a typical, large-spotted form is found - probably with very close affinities to S. c. utah of the Bonneville basin. Between these areas inhabited by the large-spotted cutthroat trout, a distinctive, fine-spotted form dominates the fishery of the Snake River. How do these two distinct types of cutthroat trout remain reproductively isolated in the essentially continuous environment of the upper Snake River? Why haven't they hybridized into a single homogeneous population? These two examples are cited to indicate that the possibility of two forms of cutthroat trout once co-existing in Bonneville basin and in Pluvial Lake Bonneville is not too remote. Unfortunately, the Pine Creek population (and their descendants in Hampton and Goshute creeks) are the only pure populations of this unique cutthroat trout known to exist. However, two specimens from Lehman Creek (on the Bonneville side of Mt. Wheeler) in the University of Michigan collection are identical with Pine Creek specimens and recent collections of trout from Mill Creek and Hendrys Creek, although slightly influenced by hybridization with introduced rainbow trout share basic similarities with the Pine Creek trout to support the assumption that this form of trout was indigenous to all the streams of the Snake Valley region. Mr. Frank Dodge, Biologist with the Nevada Fish and Game Department, and Mr. Don Cain, Wildlife Specialist with the B.L.M. (Ely, Nevada) have diligently collected specimens for this investigation. They checked Birch Creek, Trout Creek and Granit Creek, all tributary to the Snake Valley, Utah, on December 3, 1970, but found only rainbow trout. Before more authoritative conclusions can be made on the range of variability of the diagnostic characters of the Snake Valley trout and a definitive statement made on its classification,

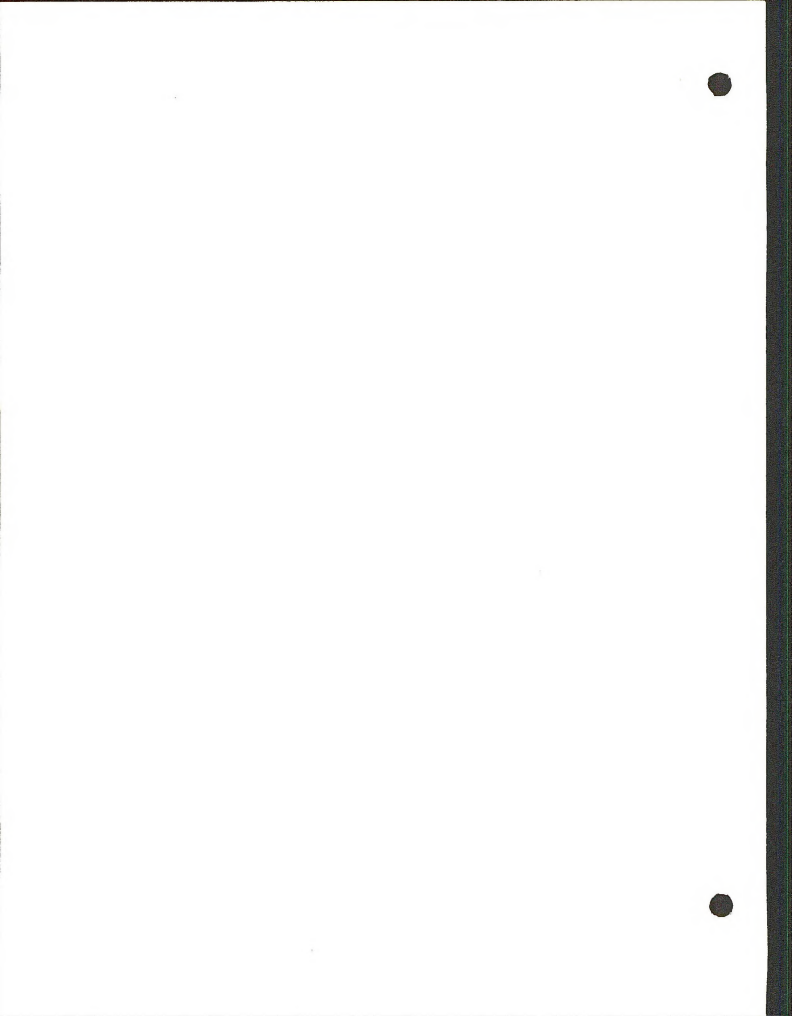


samples from more pure populations will be necessary. The most likely area where such populations may be found, is in the isolated streams in

the Deep Creek Range on the Goshute Indian Reservation. ^{note Johnson, Calk. is} only stream on Goshute Res. ^{up trout with cutthroat characters, but they are thoroughly hybridized.}

According to the testimony of an "old timer" cited in a letter

from Ted Frantz of Nevada Fish and Game to Dr. R.R. Miller, University of Michigan, written October 19, 1953, only Hendrys Creek originally contained the native trout and several creeks, including Lehman Creek, were stocked with trout from Hendrys Creek. Thus, it is possible that all the trout samples included in Table 2 were ultimately derived from Hendrys Creek. It is recorded that Yellowstone cutthroat trout and rainbow trout, particularly the latter, have been stocked in Hendrys, Mill and Lehman creeks. All of the specimens collected in 1970 from Hendrys and Mill creeks, phenotypically resemble pure cutthroat trout and bear a strong similarity to Pine Creek specimens. The meristic data, however, particularly the lack of basibranchial teeth in several Hendrys Creek specimens and higher vertebral counts and lower gillraker number in Mill Creek trout, indicates that these populations have been introgressed with non-native trout. If the lower mean values for gillrakers, basibranchial teeth and pyloric caeca in the Pine Creek stock introduced into Hampton and Goshute creeks is a reality and has a genetic basis, it is probably due to the "Founder's Principle". That is, the few individuals used to establish the new populations in these creeks did not represent the genotype producing the modal values found in the Pine Creek population, but were more towards the lower extreme of variability for these characters.



Summary

The first group of specimens in Table 1, collected from 1872-1915 from the Salt Lake and Utah Lake drainages appear to be a relatively uniform group and can be used to characterize S. c. utah. They have large, round spots, typically more concentrated posteriorly, and anteriorly the spots are mostly above the lateral line. Such a spotting pattern is quite typical of interior cutthroat trout in general. Compared with neighboring subspecies, S. c. lewisi and S. c. pleuriticus I find only slight differences. The scale counts average about 10-20 fewer in S. c. utah and the vertebral count is about one more than in the typical lewisi and pleuriticus. The large spotted cutthroat trout in the upper Snake River (and Yellowstone Lake) although called S. c. lewisi on geographical grounds, probably share closer affinities with S. c. utah than they do with S. c. lewisi of the Columbia and Missouri river systems. The other samples indicate some variability was present among Bonneville basin trout, as would be expected after several thousand years of isolation, but none appear as extremely differentiated as the Pine Creek population, representing the Snake Valley trout. Besides the unusual morphology, the Snake Valley trout have fewer scales, more gillrakers, many more basibranchial teeth and a more uniform distribution of spots on the body. Based on the present material and state of knowledge, I can not state with any authority if the distinctive traits of the Snake Valley trout ultimately rests on a single differentiated population from one stream (Hendrys Creek?) or if this form of trout was once the native trout of the whole Snake Valley (and probably once co-existing in Lake Bonneville with S. c. utah). If the latter alternative is the case, then this trout should be described as a new subspecies. Hopefully,



future collections, particularly from the Goshute Indian Reservation will help to provide the necessary information.

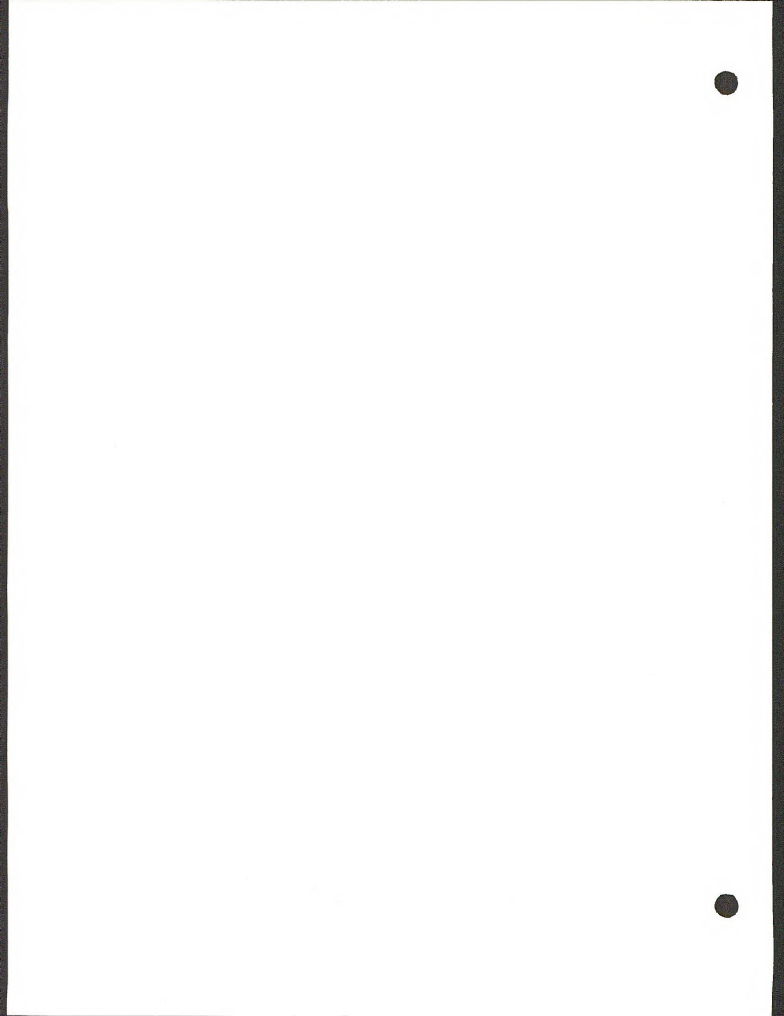
Considering new techniques which may yield valuable information on the origin and affinities of the Snake Valley cutthroat trout, I would like to obtain karyotypes of the Pine Creek stock and other ^{this was done they are (2n ~ 106)} ~~pos-~~ ^{as} ~~sibly~~ ^{expected} pure populations, to see if they are typical of other interior cutthroat trout so far examined - a diploid complement of 64 chromosomes with a total of 106 arms. At present biochemical taxonomy would have limited application, perhaps assessing relative pureness of populations by gene frequency data, but for a clearer picture of evolutionary affinities more must be known about variability in specific proteins in several forms of cutthroat trout - information that is not now available (See Behnke, 1970, for more details on these techniques and their applicability to systematic studies of western North American Salmo).

Salmo clarki utah is listed as a rare fish in the International Union for the Conservation of Nature's Red Data Book, vol. 4, 1969 (See attached sheet). In the U.S. Dept. of Interior's Red Book of Rare and Endangered Species (1968) S. c. utah is listed as "status undetermined." Taxonomically, I would agree, S. c. utah has a nebulous status. There is such broad overlap of characters between most of the recognized subspecies of cutthroat trout, that they lack validity as taxonomic units. There is no doubt, however, that pure, native populations of Bonneville cutthroat trout (both forms) are extremely rare and should receive all possible protection. For the preservation and management of rare forms of native trouts, the typological approach, treating them as taxonomic units can be unwise. More correctly the cutthroat trout species represents an array of unique genotypes, and each genotype may have special attributes, so that a single subspecies such as S. c. utah



may contain a large amount of genetic variability and ecological divergence. Undoubtably, the lacustrine population of native cutthroat trout persisting until relatively recent times in Bear Lake, Utah - Idaho had special physiological and ecological adaptations shaped by the environment of Bear Lake - and superimposed on a longer evolutionary history in Lake Bonneville. I doubt that any other population of S. c. utah could be used to precisely duplicate the life history and behavior of the original Bear Lake cutthroat trout.

It can be concluded that the Pine Creek population represents a pure form of the Snake Valley form of Bonneville cutthroat trout, but a pure population of S. c. utah can not be cited with authority; probably the population in the headwaters of Reservoir Canyon, near Pine Valley is the most likely choice.



Literature Cited

- Behnke, R.J. 1970. The application of cytogenetic and biochemical systematics to phylogenetic problems in the family Salmonidae. Trans. Am. Fish. Soc., 99 (1): 237-248.
- Cope, O.B. 1955. The future of the cutthroat trout in Utah. Proc. Utah Acad. Sci. Arts and Lett., 32: 89-93.
- Hubbs, C.L. and R.R. Miller. 1948. Correlation between fish distribution and hydrographic history in the desert basins of western United States. Bull. Univ. Utah, Biol. Ser., 10 (7): 17-166.
- Miller, R.R. 1950. Notes on the cutthroat and rainbow trouts with the description of a new species from the Gila River, New Mexico. Occasional Pap. Mus. Zool. Univ. Mich. (529): 1-42.
- Suckley, G. 1861. Monograph of the genus Salmo. Reprinted in: Rept. U.S. Comm. Fish. for 1872-73: 91-160.

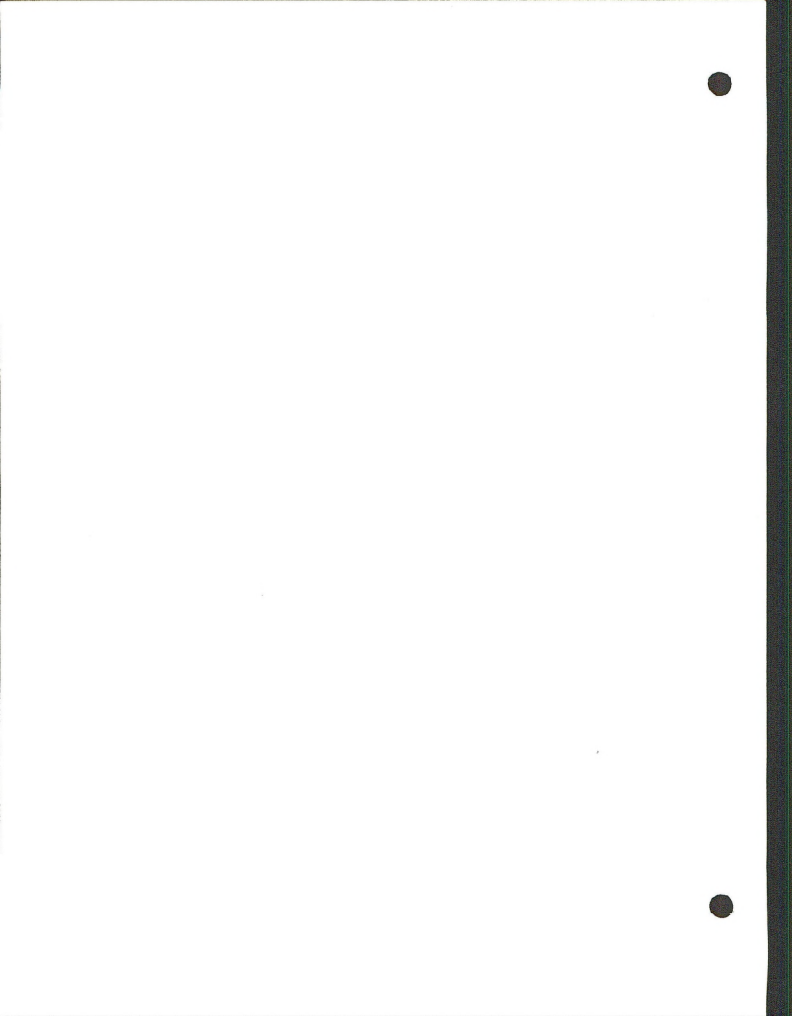


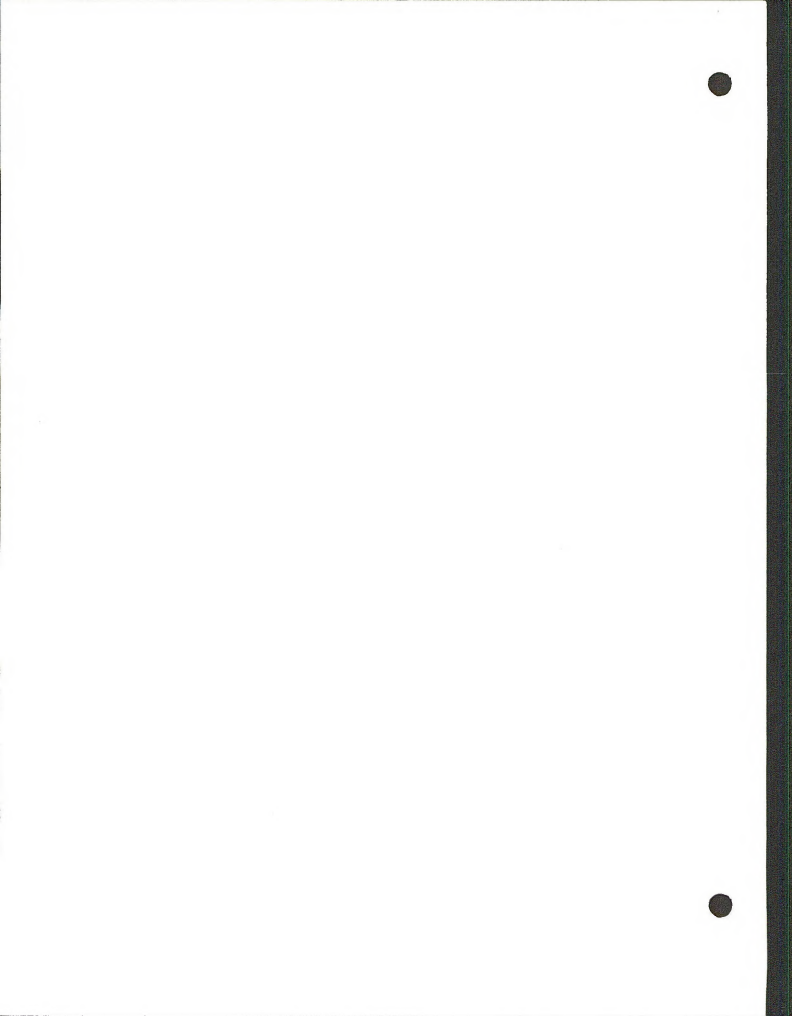
TABLE 1. Meristic variation in samples of native Bonneville basin cutthroat trout

Locality	Vertebrae			Gillrakers			Scales above lateral line			Scales, lateral series			Basibranchial teeth			Caeca		
	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$
Salt Lake-Utah Lake drainages coll. 1872-1915	19	61-65	63.0	19	17-22	19.7	19	32-43	37.8	10	150-186	165.0	14	3-13	7.9			
Isolated trib. to Little Cottonwood Cr., Salt Lake Co., 1967	4	62-63	62.2	10	18-22	19.1	5	34-37	35.4	5	148-163	154.4	3 more than 100 mm 7-12	9.3	15	27-39	3	
Bear R., 1915 Fish Haven, Idaho				7	18-19	18.7	7	37-44	40.3	7	157-178	168.4	one no teeth 7 0-10	4.0				
Thomas Fork, Bear R., Wyoming. 1968	6	61-63	62.0	7	18-20	19.1	7	35-42	38.4	7	142-173	160.9	7	2-7	4.4	7	31-42	3
Beaver R., disrupted trib. Sevier R., 1872	8	61-63	62.3	8	20-21	20.5	7	37.40	38.9				one no teeth 8 0-19	8.6				
Mammoth Cr., trib. Sevier R., 1915				5	19-23	20.8	5	37-39	38.0				5	2-3	2.4			
Asay Cr., near Hatch, trib. Sevier R.	2	63,63		2	18,20		2	39,40		2	149,158		2	4,5			27,36	
Reservoir Canyon near Pine Valley (probably introduced from Sevier drainage.)	31	61-64	62.1	30	17-21	19.3	30	38-46	41.5	30	139-182	159.3	2 no teeth 31 0-9	4.3				



TABLE 2. Meristic variation in Pine Creek and Snake Valley cutthroat trout

Locality	Vertebrae			Gillrakers			Scales above lateral line			Scales, lateral series			Basibranchial teeth			Piglets		
	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$	N	Range	$\bar{X}$
Pine Cr., Nev., 1959, 1970	37	60-64	62.3	41	19-23	21.4	29	37-44	39.1	35	133-156	142.1	40	13-55	30.1	10	30-47	39.
Hampton Cr. (Pine Cr. stock), 1970				10	20-21	20.5	10	39-43	41.0	10	141-157	149.8	10	17-27	22	10	29-36	33.
Goshute Cr., (Pine Cr. stock), 1970				10	19-21	20.1	10	38-52	40.2	10	135-160	143.1	10	11-30	19	10	31-37	34.
Hendrys Cr., extreme head- waters, 1970				7	20-22	20.9	7	41-44	42.1	7	146-175	155.3	7	4 no teeth 3 with 13, 15, 16		7	33-46	39.
Hendrys Cr., downstream, 1970	9	61-63	61.9	10	18-22	20.5	7	36-42	39.7	8	142-160	152.1	10	7 no teeth 3 with 1, 1, 6		8	35-47	41
N. Mill Cr., 1970	6	63-64	63.5	9	18-21	19.7	5	39-45	42.0	5	150-169	161.0	5	3-30	20	10	39-51	43
Lehman Cr., 1938	2	62, 62		2	20, 21		2	42, 42		1	148		2	17, 20				



Common name: Bonneville cutthroat trout

Scientific name: *Salmo alarki utah* Suckley

Order: Salmoniformes

Family: Salmonidae

Distinguishing characteristics:

Medium-large spots; scales in lateral series, 145-180; vertebrae 61-64; gillrakers 18-21.

Present distribution:

Pure populations unknown; the cutthroat trout population in the headwaters of Reservoir Canyon, near Pine Valley, Utah, in the Virgin River drainage may be the result of introductions from the Sevier River system of the Bonneville Basin.

Former distribution:

Bonneville basin - Utah, Nevada. There is evidence that two somewhat distinct forms of cutthroat inhabited the Bonneville basin. The name *utah* would apply to the populations of the Provo, Jordan, Bear, and Sevier river systems. Specimens from Mt. Wheeler on the western rim of the basin appear more similar to the cutthroat trout of the Humboldt River system, Nevada.

Status: Endangered?

Estimated numbers: Unknown; perhaps 200-300 trout inhabit the headwaters of Reservoir Canyon; rainbow-cutthroat hybrids occur in lower reaches.

Breeding rate in wild/Fecundity: Unknown

Reasons for decline:

Alteration of habitat, water diversion, hybridization with introduced rainbow trout and exotic subspecies of cutthroat, competition with eastern brook trout.

Protective measures taken: None

Measures proposed:

Continued systematic study to determine the relationships of present existing cutthroat populations and to investigate the differentiation within the basin.

Number in captivity: None

Breeding potential in captivity: Unknown

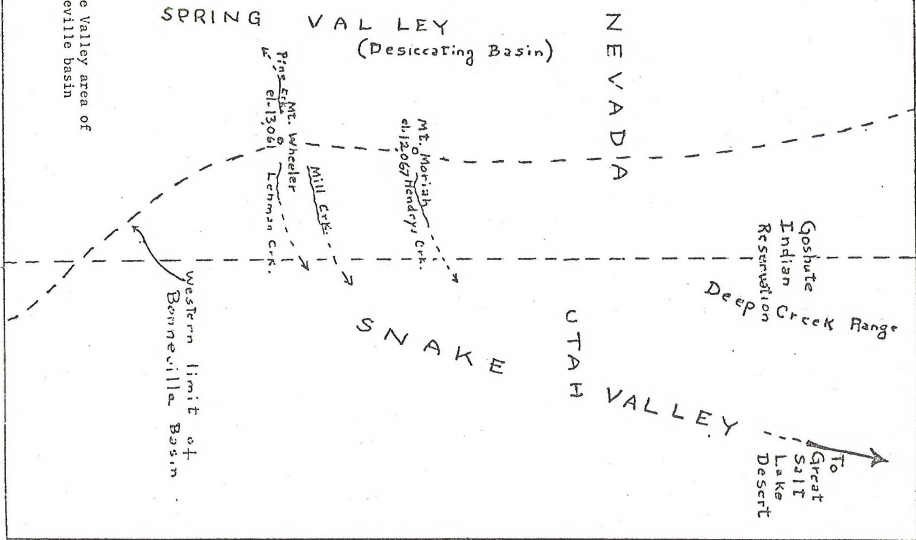
Remarks: The Bonneville cutthroat is so similar to the widely propagated Yellowstone Lake cutthroat (*S.c. lewisi*) that a large sample is necessary to distinguish them with any authority. The state of Utah propagates Strawberry Lake trout as the "native" trout in the Bonneville Basin. This population was originally Colorado River cutthroat (*S.c. pleuriticus*) but almost certainly is now a mixture of *S.c. pleuriticus* x *S.c. lewisi* and *S. gairdneri*.

References: Cope, O.B. 1955. The future of the cutthroat trout in Utah. Proc. Utah Acad. Sci. Arts and Lett., 32:89-93.



SCHELL CREEK RANGE

FIGURE 1. Snake Valley area of Bonneville basin





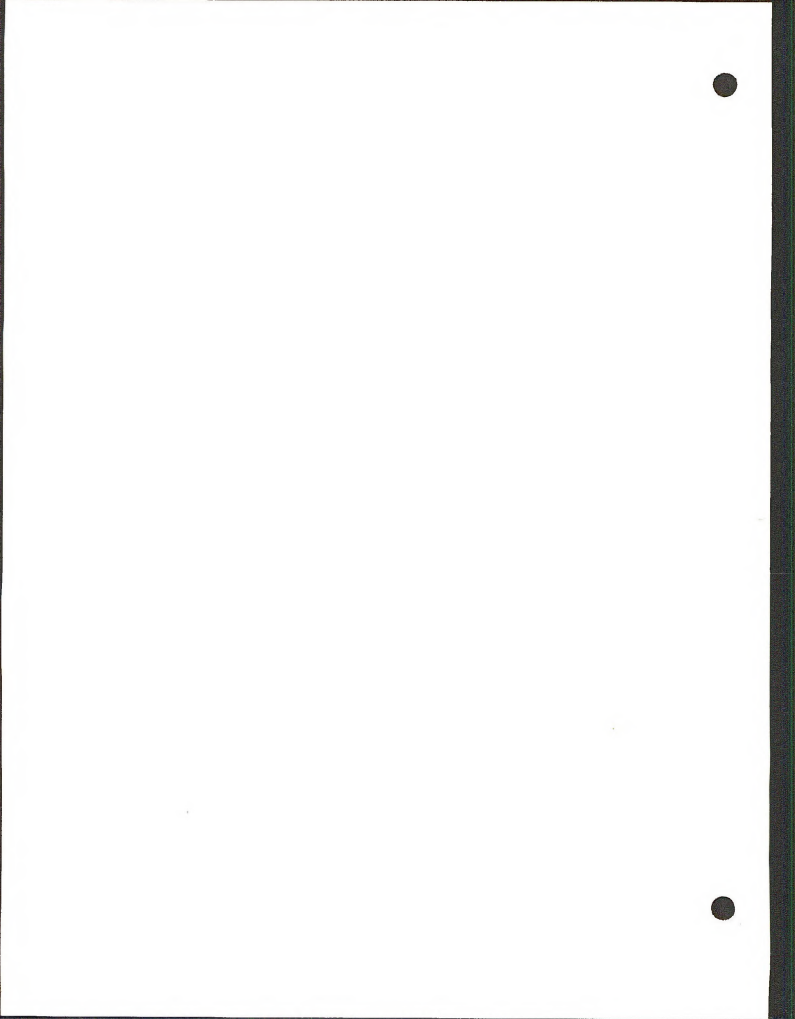
Birch Creek Fisheries Data,

1958

TABLE I. STANDING CROP OF ALL FISH IN ONE-TENTH MILE OF STREAM
ON BIRCH CREEK

<u>Miles from Mouth</u>	<u>Location</u>	<u>Date</u>	<u>Fish Caught</u> <u>Cutthroat</u>
4	USFS Boundary	7/14/58	1

1/ Table 1 & 2:
Taken from: Appendix I, Natural Resource Inventory, Beaver River Basin,
Utah-Nevada by U.S.D.A. & Utah State Dept. of Natural Resources, June 1973



APPENDIX IV

TABLE 2. PHYSICAL AND BIOLOGICAL CHARACTER OF BIRCH CREEK, 1958

Stream	Date	Elevation	Velocity	Volume	Width	Depth	Pools per mile	Ratio of pools	Depth of pools	Temperature	Environmental Factors						Stream classifici grade
		Feet	FPS	CFS	Feet	In.	No.		In.	°F.	Shade	Watershed condition	Turbidity	Bottom type	Bottom fauna	Aquatic vege.	
											Gr.Pt.	Gr.Pt.	Gr.Pt.	Gr.Pt.	Gr.Pt.	Gr.Pt.	
Birch Creek	7-14	7,700	2.5	5	4	6	200	1:53	6	67	2	2	4	4	3	3	B



APPENDIX V

A PRELIMINARY REPORT OF THE BIRCH CREEK FISH HABITAT ANALYSIS 1

INTRODUCTION

Birch Creek, a tributary to the Beaver River, contains a remnant population of the Utah cutthroat trout. This sub-species of cutthroat has been designated within the Intermountain Region as unique and warranting special protection and/or management efforts.

To determine the quality of stream habitat and condition of the trout population in Birch Creek, a survey was conducted during June 25-27, 1974, jointly by personnel of the Forest Service, BLM, and the State Division of Wildlife Resources. The purpose of the survey was to obtain data on the stream's physical and biological characteristics and to see how these are being affected by land management activities occurring on the watershed.

The study was made using the standard Region 4 techniques which include the criteria of pool quality and availability, stream bottom materials, bank cover, bank stability, and stream gradient. In addition, continuous water temperature records and a full profile of the stream's chemical characteristics were taken. Streamflow determinations were made at the confluence of the North and South Forks and near the National Forest-BLM boundary.

Birch Creek, from the headwaters to private land, runs a distance of ten miles. Six miles are on National Forest land and four are on BLM land. Only eight miles contain water year-round. During mid-summer, the channel dries up about two miles below the National Forest boundary. Eight stations consisting of five stream transects each (40 transects in all) were established on both

Forest Service and BLM land from elevations 6500 feet to 8200 feet.

These 40 transects along the ten miles of stream were considered to be representative of over-all stream habitat conditions.

Finally, one station on BLM land and each station on Forest Service land was sampled by electrofishing by Division of Wildlife Resource personnel to obtain standing crop values of the trout population. The results of this work is shown in Table III.

RESULTS

The data from the transect evaluations of the separate stations on the Forest was compiled and analyzed as shown in Table I. The results of each habitat factor are summed and expressed in terms of an optimum habitat rating for the stream.

The term "optimum" refers to the ideal condition for a particular factor, e.g., a stream with completely productive bottom materials would possess the optimum condition for that factor. Stream water temperatures during the June through September period is shown in Table II.

Birch Creek is rated by the Division of Wildlife Resources as a Class 3 water (on a scale of 1 to 6) meaning that it has average fishery resource values. It also has national significance in that it is inhabited by the unique Utah cutthroat trout. Interest in unique or endangered species is high at this time and there is the desire that efforts be made to assure their continuation. It is for this reason that this study was undertaken on Birch Creek.

Habitat features are explained as follows:

Pool/Riffle Ratio

This is the ratio of available pool area to the available riffle area as measured under the transect line. All pools, regardless of their quality, are included in this ratio.

Pool Quality

This is an evaluation of a pool's characteristics on a scale of one to five. It is based primarily on the pool's linear dimensions in relation to the stream's width.

Stream Bottom

Only certain bottom types contribute to stream productivity. These include rubble, gravel, and organic debris. Other types such as muck, clay, silt, boulders, and bedrock are relatively unimportant to game fish production in a stream. The amounts of each of these materials in the transect were measured and noted on the data sheets.

Bank Cover

This is a measure of the degree stream shading and hiding area afforded by streamside vegetation or other physical features. The factor is rated on a scale of one to four for each bank on the transect line.

Bank Stability

This is a measure of the erodability of the stream banks lying on the transect. It can be caused by cattle use, road encroachment, and natural channel meander.

The erodability is rated on a scale of one to four and is an indication of the siltation entering the stream at this point.

The most important habitat feature of a stream in maintaining an adult trout population is the number and quality of pools. In the case of Birch Creek, an equally important feature, not usually ranked so highly, is spawning area. This is important here since, until the trout in this stream are artificially propagated in hatcheries, it will be necessary for instream spawning to maintain the fishes' survival.

The over-all rating for Birch Creek, based on percent of optimum conditions of the above habitat features, was 39 percent. This is not a bad figure for a wild stream that has not been managed to optimize its aquatic resources. There are areas where the stream lacks important habitat features. Generally, these poor quality features can be correlated with other uses occurring on the watershed and will be discussed in the section for each station.

Station No. 5

(Stations one through four were on BLM land and an evaluation of the data from those stations will be made by BLM personnel.)

This station was located in an area of heavy beaver activity. They have been in the area for some time and habitat degradation from their presence was becoming apparent. More than 80 percent of the stream surface was pool type which converted to the relatively low 40 percent optimum pool-riffle ratio. Pool quality was very poor at 16 percent due to heavy sediment buildup behind the beaver dams. The outstanding feature of this station was the amount of

bank cover (83 percent of optimum) afforded by riparian vegetation. However, the over-all habitat value of this station was poor. Streamflow metering showed the flow to be .52 cfs., just below this station on June 27.

Station No. 6

This station was located at an elevation of 7640 feet in an exposed reach of the stream. The pool/riffle ratio was excellent at 80 percent. Pool quality had improved only slightly from the previous station at 24 percent.

Stream bottom materials were an important characteristic in areas represented by this station. Nineteen percent of the optimum bottom types were present here and spawning gravels comprised a large part of these materials. However, siltation made some of these gravels unsuitable for spawning. Bank cover in this area was very poor at 16 percent, due probably to the livestock use of the area and the presence of a road paralleling the stream. Bank stability was good at 41 percent due to the shallow bank slopes and lack of cut and sloughing banks. The over-all rating for the station was 36 percent of optimum.

Station No. 7

This station was located at 8200 feet elevation on the South Fork of Birch Creek, just above the confluence with the North Fork. The surrounding terrain is steep and forested as would be indicated by the gradient of 7.2 percent. The measured streamflow through this station on June 27 was .1 cfs.

The steep gradient, meager flow, and small channel limit the value of this area as usable trout habitat. But what habitat there is ranks well in quality with a 45 percent of optimum. Pool quality, bank cover, and bank stability are fair

to outstanding in their rating. The primary value of stream areas represented by this station is as a holding and nursery area for juvenile trout.

Station No. 8

This station was located adjacent to Station No. 7 on the North Fork Birch Creek. The streamflow was somewhat greater than Station 7 with .3 cfs. The pool/riffle ratio was only 34 percent optimum and none of these were rated high in quality. For this reason this station provides poor habitat for adult trout and its main value, again, would be as a juvenile trout rearing area.

ELECTROFISHING RESULTS

The results of trout population estimates made by the Division of Wildlife Resources show that trout numbers decrease in the lower reaches of Birch Creek. In the stretch of stream just below the confluence of the North and South Forks the population is greatest at 43.2 pounds per acre. This is an above average standing crop value and indicates a relatively high basic productivity characteristic of Birch Creek drainage.

The sample taken in the vicinity of Station No. 6 shows a figure of 21.4 pounds per acre, 14.4 pounds per acre was observed just below the Forest boundary. The occurrence of these decreasing population levels correlate very well with the degree of impact other uses are having on the stream. The highest standing crop value is found in the stretch where relatively little use occurs on the stream. The area is forested with a low level of cattle use and no road access. The area supporting 21.4 pounds was located just above Station No. 6. Cattle congregate heavily in this area and consequently it provides the lowest habitat value of any of the stations. Bank vegetation was especially lacking here so

water temperatures would increase substantially through this area.

The lowest value of 14.4 pounds was found just below the Forest Service-BLM boundary. This area is below the beaver ponds and receives the silt load that is caused by cattle "hanging out" in the stream between Stations No. 6 and No. 5. No trout were observed below this point on the stream even though there is an additional two to three miles of flowing water. A ventured guess would be that excessive water temperatures and a high degree of siltation make this area unsuitable as trout habitat. Improving upstream watershed conditions by reducing the effects other uses are having on the stream and riparian areas would probably result in the entire stretch of stream on BLM land becoming productive trout habitat.

DISCUSSION

The over-all limiting factors in the aquatic habitat of Birch Creek are the low streamflows which occur during the summer months and high water temperatures occurring at the lower end of the drainage. Measurements on June 27 and October 7 at the Forest Service-BLM boundary showed the flow to be .52 cfs and .25 cfs respectively. Thermograph records show that water temperatures can exceed 65 degrees by mid-June at the Forest Service-BLM boundary.

Other major factors, aside from the low streamflows and high water temperatures, which affect habitat quality of the stream are (1) livestock use on the watershed, (2) a poor quality road which runs adjacent to the stream for two miles, (3) a beaver colony using the stream about half a mile above the Forest Service-BLM boundary, and (4) natural hydrologic actions of the stream including bedload movement and channel meander.

The grazing use of the drainage by livestock is concentrated on the lower reach of the stream on Forest land primarily on Stations No. 5 and No. 6. The effects of this use are shown in a greater incidence of unstable banks and decreased bank cover at these stations. The average values at the lower stations (where cattle use was concentrated) for bank cover and stability were 52 and 36 percent respectively. For the upper stations these values were 81 and 55 percent.

There were no measurements taken of the suspended sediments in the stream, but it was visually noticeable that when cattle were using the area the water was more turbid. In addition to causing reductions in food producing areas and spawning areas, turbidity also causes increased stream temperatures.

The primary effects of the road paralleling Birch Creek are in unstable banks and increased suspended sediments coming from the road during summer storms or spring snow melt. None of the stations were in an area where the road encroached on the streambank so direct measurement of increased bank instability was not made. But this characteristic was clearly observed while inspecting the stream reaches outside the transect area. At one point on the stream (between the upper and lower stations) the stream actually leaves its natural channel and courses for about a quarter of a mile down the roadbed. This area is unstable during high flows and probably results in a substantial increase in the sediment load of the stream.

Beaver are another source of problems to the quality of habitat on Birch Creek. It is generally accepted that beaver activity enhances the quality of trout habitat on a stream. In the case of Birch Creek, however, this apparently is

not the case. The ponding of water behind dams with slower water velocities and greater surface area coupled with the eventual loss of bank vegetation as the aspen are cut results in increased stream temperatures. Also, high turbidity levels in the ponds add to the warming effect and lead to downstream sedimentation. Finally, as the beaver settlements are abandoned, highly unstable areas are left behind which take years to develop into productive areas again.

Past uses of the watershed have caused damages to the stream which are still evident today. Bank cutting and erosion are occurring in some areas and in others the channel is building up. The causes of these changes occurred around the turn of the century. Overuse of watershed rangeland was common and resulted in the present unstable conditions. In recent years, however, this situation has been reversed and with the use of current range management techniques the watershed should undergo a gradual recovery and improvement. This, in turn, will lead to improved instream conditions. This process will take a long period of time, however.

RECOMMENDATIONS

It was the purpose of the study to determine what should be done in watershed management practices to rehabilitate and protect the fishery habitat of Birch Creek. Any program to accomplish this should include the coordinated efforts of each of the agencies involved in the study. This would permit management of the stream as a unit rather than segmented portions. Benefits to stream habitat would be correspondingly greater if a coordinated program was used.

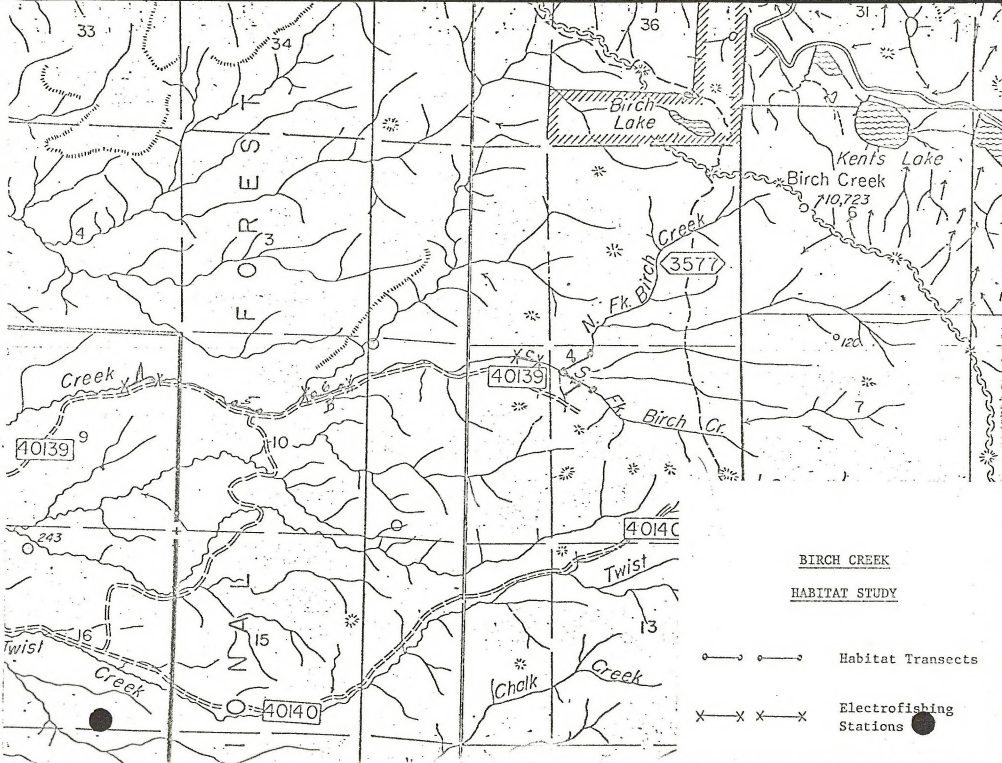
As was pointed out above, the main causes of stream habitat deficiencies in Birch Creek are: (1) the patterns of livestock use in the stream area, (2) the location and condition of an access road in the watershed, and (3) beaver activity on the stream.

In order to remedy the adverse effects associated with these uses the following recommendations are made.

1. Develop a rest-rotation grazing plan for the watershed so that riparian vegetation on Birch Creek can become established and provide better protection to the streambank and more shading to the stream. This may require the installation of off-stream stock watering troughs to keep cattle from congregating on the stream.
2. Close the present road in the area adjacent the stream and relocate to a ridge route if vehicle access to the area is necessary. The stream should also be returned to its natural channel in the stretch where it is presently coursing down the roadway.
3. Beaver should be trapped and moved out of the drainage and future colonies should be prevented from becoming established. Rather than letting the present beaver dams undergo natural deterioration and rehabilitation, a process which will take years and cause continual water quality problems, the dams should be removed. The stream channel through the beaver area should be cleared out and stabilized with plantings of suitable riparian species.

4. Conduct annual follow-up assessments of stream conditions to determine if the above recommendations are having the desired effect of improving stream habitat. Carry out ^{fish} inch measures as may be indicated from these assessments if the habitat is ^{not} ~~now~~ undergoing a recovery.

Proper land management practices on the watershed could make the entire length of Birch Creek productive trout habitat. In the event that the Utah cutthroat trout is declared a threatened species the area would be used as a source of pure strain fish to be planted in other drainages. In that case the entire productive capacity of the stream would be needed.



BIRCH CREEK

HABITAT STUDY

—○—○— Habitat Transects

x—x—x—x Electrofishing Stations

TABLE I

PHYSICAL STREAM CHARACTERISTICSBIRCH CREEK (Forest Land Only)

Station	Pool/Riffle Ratio	Pool Quality	Stream Bottom	Bank Cover	Bank Stability	Percent Optimum	Stream Gradient	Average Depth (Ft.)	Average Width (Ft.)	Average Velocity (f/s)	Stream- flow (cfs)	Degree Siltat- ion
5	40%	16%	12%	88%	31%	37%	2.3%	.5	7.2	.5	.52	28%
6	80%	24%	19%	16%	41%	36%	2.3%	.2	4.0	.6	.52	3%
7	40%	37%	14%	62%	71%	45%	7.2%	.2	3.0	.3	.1	3%
8	34%	0%	17%	100%	39%	38%	5.8%	.2	3.6	1.4	.3	0%
Average for 4 Stations	48%	19%	16%	67%	46%	39%	4.4%	.3	4.4	.7	-	-

TABLE II

STREAM WATER TEMPERATURES (DEGREES FAHRENHEIT)BIRCH CREEK

	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER	
Date	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1			66	53			65	52	55	42
2			65	53	66	58	65	51	55	44
3			66	54	66	56	65	51	50	48
4			62	55	67	56	65	54	51	46
5			65	55	67	57	65	51	50	44
6			65	57	66	56	66	54	50	41
7			65	53	60	55	64	56	50	42
8			66	55	62	54	67	54	53	46
9			68	55	63	54	65	55	51	47
10			66	54	64	54	66	55	51	46
11			66	51	66	51	64	55	49	42
12			68	54	60	53	63	51	45	39
13			66	54	64	53	61	52	47	37
14			65	58	66	52	55	46	46	37
15			62	59	66	52	53	38	47	37
16			63	59	66	51	56	43	46	37
17			63	57	68	52	57	45	49	39
18			63	55	68	53	55	45	50	41
19			60	58	68	54	59	46	50	42
20			62	57	65	54	59	47		
21			62	57	64	49	59	47		

Table II cont.

22			62	55	65	49	60	48		
23			62	55	66	50	57	48		
24			68	56	62	51	57	48		
25			67	58	62	53	57	48		
26			64	58	63	52	57	47		
27	67	53	68	57	64	52	49	43		
28	68	55	70	58	64	53	50	35		
29	68	55	72	59	65	52	53	39		
30	63	55	68	58	66	53	54	42		
31			68	59	67	52				
Mean	67	55	66	56	64	53	60	48	50	42

TABLE III

TROUT POPULATIONS ESTIMATES

(DIVISION OF WILDLIFE RESOURCES)

STATION A - 1/10 mile below U.S.F.S. boundary. 480 foot section.

<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	1	210	80
"	1	202	75
"	1	194	65
"	1	225	110
"	1	164	35
Trout per mile	55		
Trout per acre	90		
Lbs. trout per acre	14.4		

STATION B - 1/2 mile upstream of F.S. boundary.

<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	4	0 - 88	27
"	32	89 - 164	336
"	5	165 - 243	447
Trout per mile	410		
Trout per acre	492		
Lbs. trout per acre	21.4		

STATION C - 500 yards below confluence of North and South Fork of Birch Creek.
500 foot section.

<u>Species</u>	<u>No.</u>	<u>Total Length (mm)</u>	<u>Total Weight (gms)</u>
Cutthroat	14	0 - 88	58
"	30	89 - 164	695
"	14	165 - 205	862
Trout per mile	580		
Trout per acre	696		
Lbs. trout per acre	43.2		

APPENDIX VI

PHOTOGRAPHS



BIRCH CREEK PHOTOS - RECONNAISSANCE SURVEY

May 1, 1974

1. Birch Creek diversion falls off hillside (arrow) on private land creating a physical barrier to upstream movement of fish from South Creek.
2. Birch Creek diversion ditch below natural channel. No flows are now allowed into the natural channel.
3. Birch Creek on BLM at road crossing above diversion ditch. This section becomes dewatered during the summer-fall season thereby creating an additional barrier to fish movement upstream from South Creek.
4. Birch Creek, on BLM, immediately downstream from road crossing going to wildfire burn area.
5. Small pool on Birch Creek immediately below road to wildfire burn crossing on BLM land. This is good class 2 pool; note spawning gravels.
6. Birch Creek, on BLM, immediately upstream from road crossing going to wildfire burn area.
7. Small 3 foot barrier falls on USFS land immediately above BLM-USFS boundary fence. This could become a barrier to upstream movement of fish at certain flows.
8. Birch Creek on USFS, at road junction with creek upstream from BLM-USFS boundary. Utah cutthroat sample was collected by BSWF from this site. A series of beaver dams is located immediately below this site. This is an upstream view. Patterson Hollow appears in left center of photo.
9. Overgrazed stream section on USFS land adjacent to Patterson Hollow.



Photo 1

Birch Creek diversion falls off hillside (arrow) on private land creating a physical barrier to upstream movement of fish from South Creek. T.30S., R.7W., Sec. 1, SW $\frac{1}{4}$



Photo 2

Birch Creek diversion ditch below natural channel. No flows are now allowed into the natural channel. T.30S., R.7W., Sec. 1, SE $\frac{1}{4}$

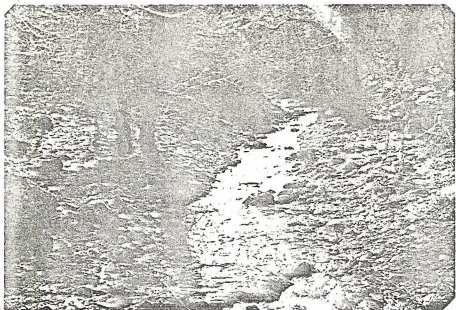


Photo 3

Birch Creek on BLM at road crossing above diversion ditch. This section becomes de-watered during the summer-fall season thereby creating an additional barrier to fish movement upstream from South Creek. T.30S., R.6W., Sec. 6, SW $\frac{1}{4}$



Photo 4

Birch Creek, on BLM, immediately downstream from road crossing, going to wildlife burn area. T.30S., R.6W., Sec. 9.



Photo 5

Small pool on Birch Creek
immediately below road
crossing on BLM land. This is
a good class 2 pool. Note
spawning gravels. (T.30S.,
R.6W., Sec. 9)

Photo 6

Birch Creek, on BLM,
immediately upstream
from road crossing,
going to wildlife burn
area. (T.30S., R.6W., Sec. 9)



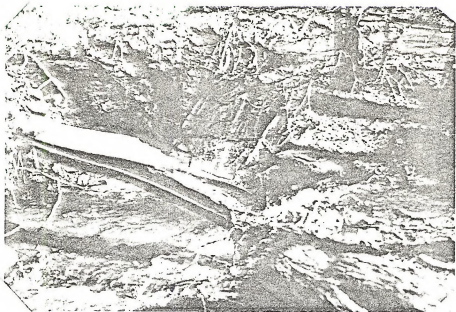


Photo 7

Small 3 foot barrier falls on USFS land immediately above BLM-USFS boundary fence. This could become a barrier to upstream movement of fish at certain flows.



Photo 8

Birch Creek on USFS, at road junction with creek upstream from BLM-USFS boundary. Utah cutthroat sample was collected by BSFW from this site. A series of beaver dams is located immediately below this site. This is an upstream view. Patterson Hollow appears in left center of photo.



Photo 9

Overgrazed stream section on USFS land
adjacent to Patterson Hollow.
(1.30S., R.6W., Sec. 10.)

BIRCH CREEK

Stream Habitat Survey Photos

June 26, 27, 1974

Photos 1-31



Photo 1 Survey Station S-1 Reference Point on NRL. Located about 1/2
upstream from road crossing. Looking up stream 6/26/74
(T/30S., R.6W., Sec. 6, SW $\frac{1}{4}$)

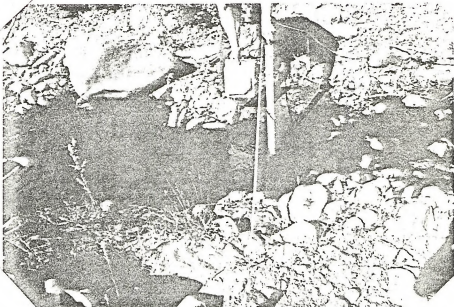


Photo 2 Survey Station S-1 T-3 6/26/74
Cross-channel photograph



Photo 3

Survey Station S-1 T-3 6/26/74
Downstream view on NRL.
(T.30S., R.6W., Sec. 6., SW $\frac{1}{4}$)



Photo 4

Survey Station S-1 T-3 6/26/74

Upstream view. Some livestock activity noted
along this stream reach. No fish observed.



Photo 5 Debris caught in stream channel has created a 6 foot falls and a barrier to fish movement, on NRL in Cottonwood Canyon area. NE $\frac{1}{4}$ Sec. 7, T.30S., R. 6 W.



Photo 6

Cottonwood area NE $\frac{1}{4}$ Sec. 7, T. 30 S., R. 6 W., this part of stream is dry in late summer. Area contains good pools and voer for fish but no fish observed.



Survey Station S-2 6/26/74

Photo 7

Reference Point on NRL at upstream end of
Cottonwood Canyon area; T.30S., R.6W., Sec. 8.



Photo 8

Survey Station S-2 Transect T-5
Cross-channel photograph 6/26/74



Photo 9

Survey Station S-2 Transect T-5 on NRL.

Upstream Photograph 6/26/74

Note milky water and fine sediments in stream.
No fish observed.



Photo 10

Birch Creek flows through the south end of 185 acres fire that burned in June 1971, on NRL. Oak brush resprouting is vigorous since the fire. T.30S., R.6W., Sec. 9.



Photo 11

An understory of wheatgrass shows up as yellow in the dead juniper trees. This wildfire burn is located about one mile west of the USFS boundary.



Photo 12

A good stand of Crested and Intermediate wheatgrass has become established. The fire occurred June of 1971. This photo was taken in August of 1974.

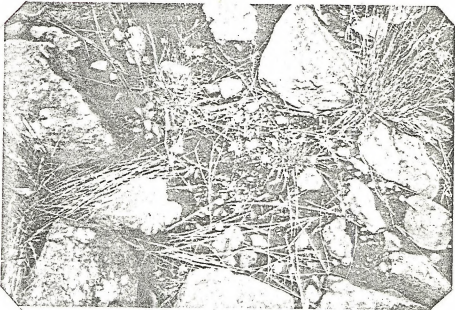


Photo 13

Litter, seed and seedlings are being produced in the burn area except adjacent to the creek where concentrated cattle use is occurring.



Photo 14

Survey Station S-3, T-5 on NRL.
Upstream View in wildlife burn area.
7-31-74



Photo 15

Survey station T-5,
S-3, same as above.
Cattle use heavy in
this area. Note
lack of riparian
vegetation although
it has been 3 yrs
since the burn.



Photo 16

Survey Station S-3, T-5 on NRL.

Downstream View in wildlife burn area. T-31-74
7-31-74

(T.30S., R.6W., Sec. 9)

Livestock use is excessive along stream bank area
and riparian vegetation is eliminated. Water temper-
ature is 82 F at 1230 hrs.

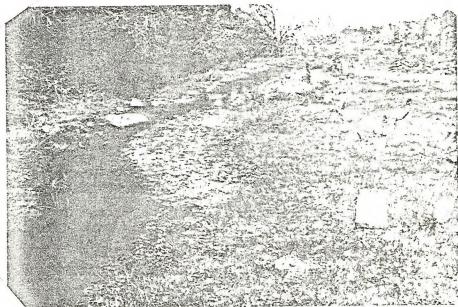


Photo 17

Same as above.

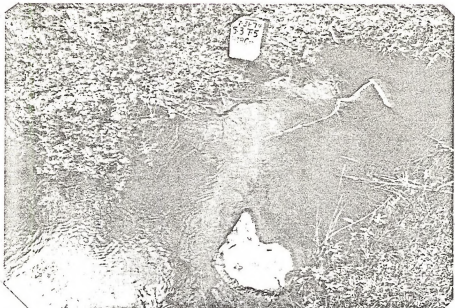


Photo 18

Survey Station S-3, T-5 on NRL.
Cross Channel View in wildlife burn area.
7-31-74

Good class 4 pool area present but note streambottom
silts.



Photo 19

This juniper tree, like many others along Birch Creek, was cut illegally for fence posts, on NRL above S-3. (T.30S., R.6W., Sec. 9)



Photo 20
Same as above.
Note 4-wheel
drive road in
right center.



Photo 21

Only a stump and limbs remain of a juniper tree that once provided shade for the stream. The stream is less than three feet to the left of the stump.



Photo 22

Here juniper trees have been cut on both sides of the stream and the limbs left in the stream channel. (T.30s., R.6W., Sec. 9.)



Photo 23

Survey Station S-4 T-4 6/26/74
Cross-channel photo above road crossing on NRL
going to wildfire burn area.
(T.30S., R.6W., Sec. 9)

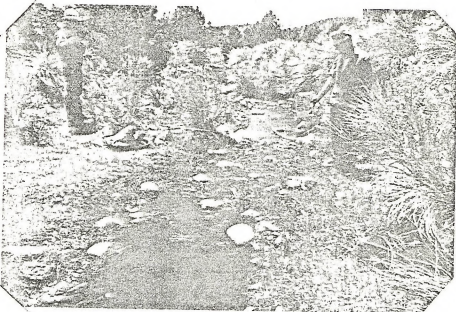


Photo 24

Survey Station S-4 T-4 6/26/74
Downstream view above road crossing to wildfire
burn area on NRL.



Photo 25

Survey Station S-4 T-4 6/26/74

Upstream view on NRL about 1/2 mile below USFS
boundary.



Photo 26

Arrow shows location of hydrothermograph on NRL immediately downstream on Birch Creek from USFS boundary.



Photo 27
Location of
Ryan hydrother-
mograph on NRL
below USFS
boundary.
Note milky and
high unstable
banks.



Photo 28

Spawning gravels on NRL; near S-4
on Birch Creek



Photo 29

Utah Cutthroat collected from Birch Creek by DWR.
Approximately 200 yards west of USFS
boundary. 6/26/74



Photo 30

Beaver activity along Birch Creek on USFS land.
Sec. 11, T. 30 S., R. 6 W., 6/26/74



Photo 31

Utah Cutthroat in Birch Creek on
USFS. 6/26/74 Collected by DWR at electrofishing
station above S-6.

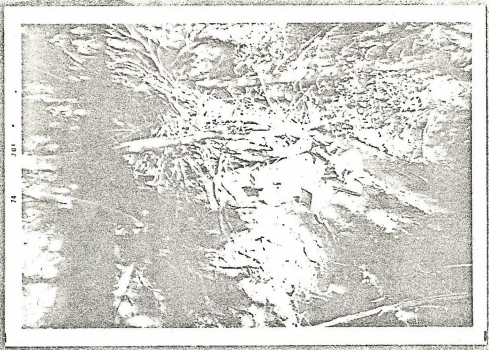


Photo 32 DWR electrofishing station above S-6 on USFS



Photo 33 DWR measuring and weighing Utah cutthroat at electrofishing station above S-6 on USFS

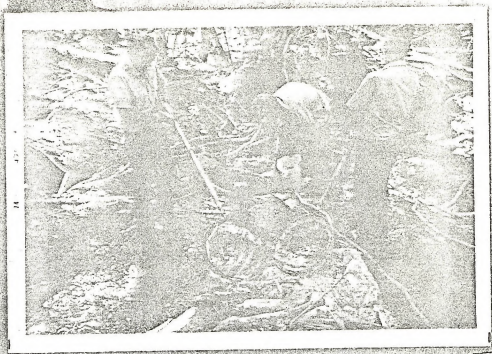


Photo 34 DWR electrofishing Birch Creek above S-6 on USFS

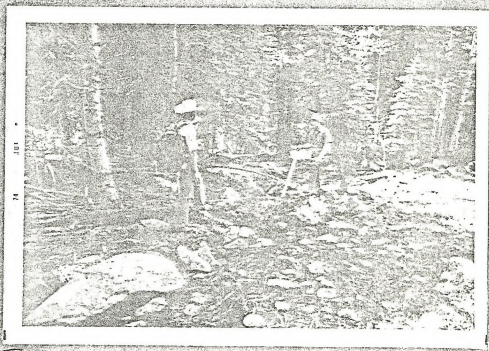


Photo 35 Stream habitat inspection on USFS above S-6 in vicinity of road-channel washout, T.30S,R6W,Sect.11.

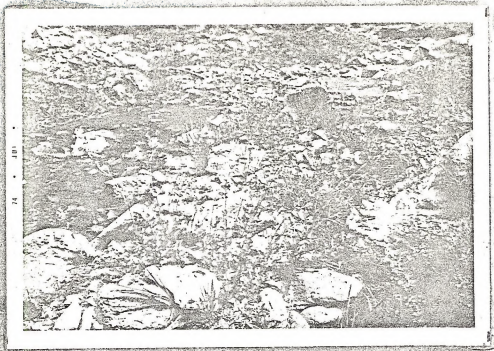


Photo 36 Birch Creek in vicinity of S-6 on USFS, T30S, R6W, Sect. 10



Photo 37 Transect S-7 on USFS at headwater forks.



Photo 38 Station S-7, T-1 on USFS. Note meadow condition & bank habitat.

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Birch Creek Interagency
Stream Habitat Survey

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